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CHARLES ELMORE CROPLEY
CLERK

IN THE

Supreme Court of the United States

OCTOBER TERM, 1942

No. 945-946 & 989

FORD MOTOR COMPANY,
Petitioner,

vs.

THE GORDON FORM LATHE COMPANY,
Respondent.

Transcript of Record

On Petition for Writ of Certiorari to the United States Circuit Court of Appeals for the Sixth Circuit

VOLUME IV.

Plaintiff's Exhibits, Defendant's Exhibits and Main Record Exhibits.

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No. .....

United States Circuit Court of Appeals

FOR THE SIXTH CIRCUIT.

THE GORDON FORM LATHE COMPANY,
Plaintiff-Appellant and Cross-Appellee,

vs.

FORD MOTOR COMPANY,
Defendant-Appellee and Cross-Appellant.

EQUITY No. 4564.

APPEAL FROM
THE DISTRICT COURT OF THE UNITED STATES,
EASTERN DISTRICT OF MICHIGAN,
SOUTHERN DIVISION.

TRANSCRIPT OF RECORD.

VOLUME IV.

Plaintiff's Exhibits, Defendant's Exhibits and Main Record Exhibits.

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SCHEDULE.....

COST SUMMARY

SYMBOL... A-6250 A1...

PART NAME..... CAMSHAFT ..... Ex 8 .....

KIND OF MATERIAL

QUANTITY MAT'L REQ.

WEIGHT { ROUGH... 11.0 lbs FINISHED.....

MONTH JAN 1930

MATERIAL PURCHASES — ☐ 70 FRT.

ORDER	DATE	QUANTITY	PRICE	UNIT	DISC.	FRT. RATE
	Dept	153-				
		181825	.0223	Lb		

AVE. FRT. EA. — AVE. INC. FRT. AND M. H. .0223

DEPT.	SCRAP	PROD'N	UNIT COSTS MAT'L	LABOR	BURDEN	TOTAL
154	10	9139	2453	0058	0075	2586
1514	1256	9971		0871	4294	5115
410	8704	90679		5819	9106	1.4625
Gen Balance	Check			0040	0057	0097
Trial Balance	Check			0009	0013	0022
SCRAP LOSS	Dept	1514 218	10 36 13 47			59 36 73 47
MNFG. PLANT COST			27.36	6447	1.3545	2.2728
SHIPPING EXPENSE						
MNFG. PLANT TO BRANCH						
DIRECT			1.5	3493		
AVE. COST TO BRANCH			1514	5.0367		
			410	3.8618		
			902	.2522		
PAINTING			2455	.0578		
TOTAL COST TO BRANCH—SERVICE				39.5578		

MONTH MAR 1930

MATERIAL PURCHASES — ☐ 70 FRT.

ORDER	DATE	QUANTITY	PRICE	UNIT	DISC.	FRT. RATE
Dept	153	972115	.0279	#		

AVE. FRT. EA. — AVE. INC. FRT. AND M. H.

DEPT.	SCRAP	PROD'N	UNIT COSTS MAT'L	LABOR	BURDEN	TOTAL
154	13	181507	3069	0057	0074	3200
1514	2815	194947		0711	3413	4124
1513	Assembly	156386		0015	0040	0055
410	4939	156386		5895	8548	1.4443
	Repair	156386		0016	0022	0038
					0007	0001
	Repair			0020	0028	0048
Scrap Loss			0046			0279
			.3548	.6716	1.7174	2.7438
MNFG. PLANT TO BRANCH						
DIRECT			1.5			
AVE. COST TO BRANCH			1514	4.4721		
			410	.0922		
			902	36.6432		
PAINTING			902 2455	.0777		
TOTAL COST TO BRANCH—SERVICE				.7375		

PLAINTIFF'S EXHIBIT NO. D

Form 3546 1SM 6 12 29

COST SUMMARY

SCHEDULE .....

SYMBOL A-6250 Fl. ....

PART NAME CAMSHAFT

KIND OF MATERIAL

QUANTITY MAT'L REQ

WEIGHT { ROUGH... 11.0 # ..... FINISHED... M. change left ....

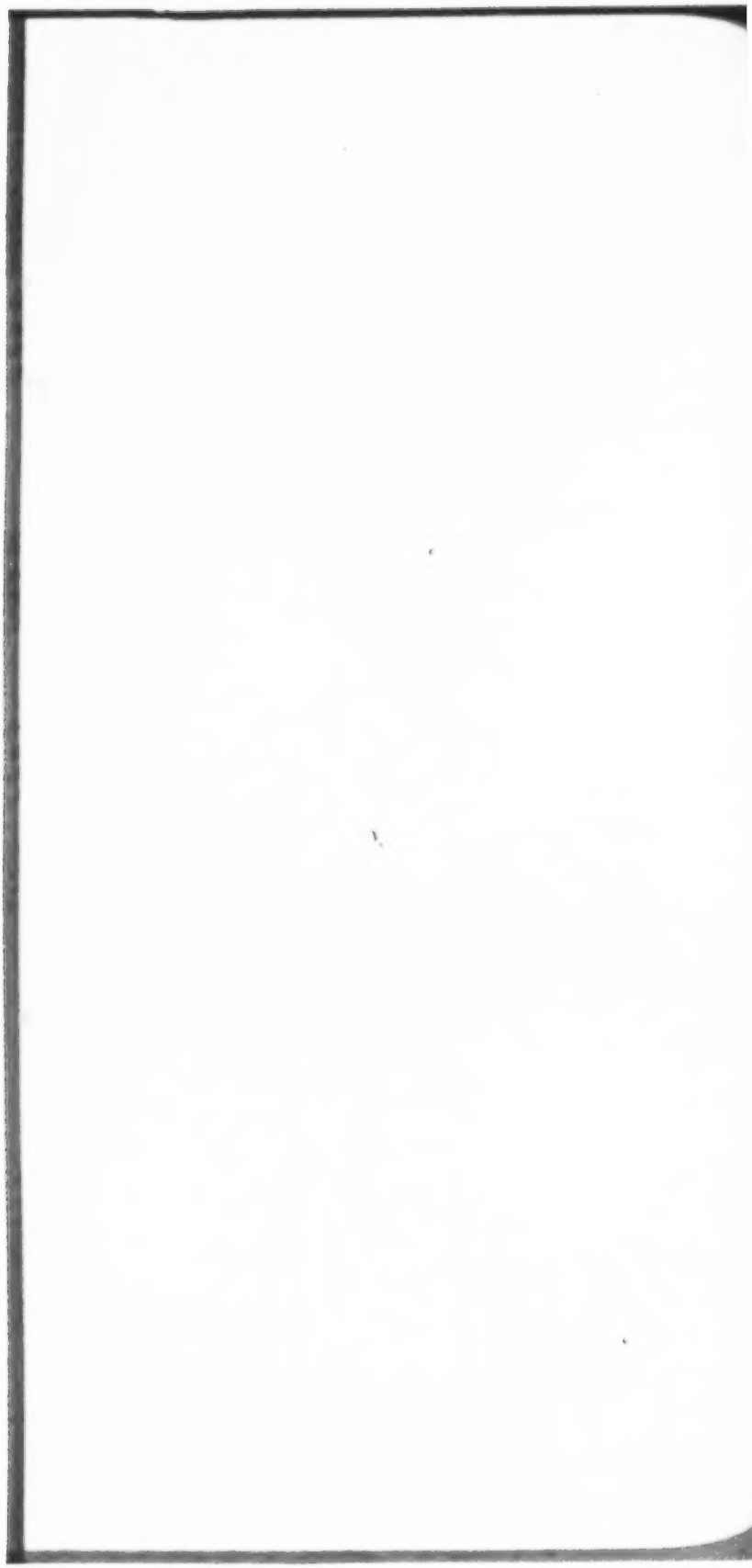
MONTH

MONTH OCT - 1929

MATERIAL PURCHASES						☐ 70 FRT	MATERIAL PURCHASES						☐ 70 FRT.
ORDER	DATE	QUANTITY	PRICE	UNIT	DISC	FRT RATE	ORDER	DATE	QUANTITY	PRICE	UNIT	DISC	FRT. RATE
		Dept 153 = 2816580# @ .0226 #					Dept 153 = 366180 @ .0251 #						
							" 153 = 696270 @ .0240 #						
							Change		1062450	.0244 #			
AVE. FRT EA.		AVE INC FRT AND M H .0226 #					AVE. FRT. EA.			AVE. INC. FRT. AND M. H.			

DEPT.	SCRAP	PROD'N	UNIT COSTS MAT'L	LABOR	BURDEN	TOTAL	DEPT.	SCRAP	PROD'N	UNIT COSTS MAT'L	LABOR	BURDEN	TOTAL
151	195	183761	2486	.0053	.0069	2608	154	144	186658	2684	.0044	.0057	2785
151	4759	186822		.0884	2652	3536	1514	4782	198703		.0831	2800	3631
184	Pickle	154561		.0002	.0006	.0008	~~184 Pickle~~						
410	4885	154561		6036	7666		410	4461	174545		5743	7466	1.3209
790													
708	Rpr	174545		.0009	.0015	.0024	2455 Repair		174545		.0005	.0007	.0012
SCRAP LOSS						.0018	902 Repair		174545		.0021	.0039	.0060
MNFG. PLANT COST						.2066	7905		174545		.0023	.0003	.0026
SHIPPING EXPENSE		Total	2747	6912	1.0418	1.3077	Scrap		1514	.0167			.0167
MNFG. PLANT TO BRANCH							TOTAL						.0164
DIRECT							DIRECT			2917	6667	1.0372	1.9956
AVE. COST TO BRANCH							AVE. COST TO BRANCH						
PAINTING							PAINTING						
TOTAL COST TO BRANCH—SERVICE							TOTAL COST TO BRANCH—SERVICE						

1405



Form 3566 10M—3-26-30

SCHEDULE.....

COST SUMMARY

E + W

SYMBOL A 6250-

PART NAME CAMSHAFT

KIND OF MATERIAL

QUANTITY MAT'L REQ.

WEIGHT ROUGH 11.0# FINISHED

MONTH [illegible] 330

MONTH [illegible] 1001

MATERIAL PURCHASES

☐ 70 FRT.

ORDER	DATE	QUANTITY	PRICE	UNIT	DISC.	FRT. RATE
Dept	153	646700	.0288	#		
	153	276418	.0285	#		
		Quan	.0286	#		

AVE. FRT. EA.

AVE. INC. FRT. AND M. H. .0286#

MATERIAL PURCHASES

ORDER	DATE	QUANTITY	PRICE	UNIT	DISC.	FR
Dept	153	1397080	2.83	Cwt		

AVE. FRT. EA.

AVE. INC. FRT. AND M. H. .02[illegible]

DEPT.	SCRAP	PROD'N	UNIT COSTS MAT'L	LABOR	BURDEN	TOTAL
154		108207	3146	0043	0056	3242
1514	1653	89898		0718	3389	4107
410	3395	93179		5636	8398	14034
2455 Repair		93179		0016	0027	0043
902 Repair		93179		0072	0122	0194
SCRAP LOSS			0060 0268			0328
MNFG. PLANT COST			3474	6485	1.1992	2.1957
SHIPPING EXPENSE						
MNFG. PLANT TO BRANCH						
DIRECT			154	.2621		
AVE. COST TO BRANCH			1514	.5431		
			410	35.0081		
			2455	.1006		
			902	.4443		
PAINTING						
TOTAL COST TO BRANCH—SERVICE				40.3582		

DEPT.	SCRAP	PROD'N	UNIT COSTS MAT'L	LABOR	BURDEN
154		123049	3113	0043	0056
1514	3233	120630		0687	4362
410	4003	96815		5486	9271
2455 Repair		96815		0019	0026
902 Repair		96815		0053	0072
SCRAP LOSS			0036 0347		
MNFG. PLANT COST			3541	6288	1.0787
SHIPPING EXPENSE					
MNFG. PLANT TO BRANCH					
DIRECT			[illegible]	[illegible]	
AVE. COST TO BRANCH				[illegible]	
				[illegible]	
				[illegible]	
PAINTING			[illegible]	[illegible]	
TOTAL COST TO BRANCH—SERVICE				373.06	

PLAINTIFF'S EXHIBIT NO. E

1406

Ford Motor Company

Manufacturers of Automobiles, Trucks and Tractors

Detroit, U.S.A.

Jan 2nd 1924

Attention: Mr. Broughton.

P-38

All correspondence and shipments are subject to rules of any strike, lockout, fire, accident, and all contingencies beyond the control of this company. Orders subject to correction

Will you please refer to order D-48697 calling for [illegible] and make the following corrections and notations

[illegible] part of this contain 40 steel forgings of Dwt. 36. These [illegible] already been sent you.

[illegible] length of the 3/8 pitch ½" wide roller chain is 28".

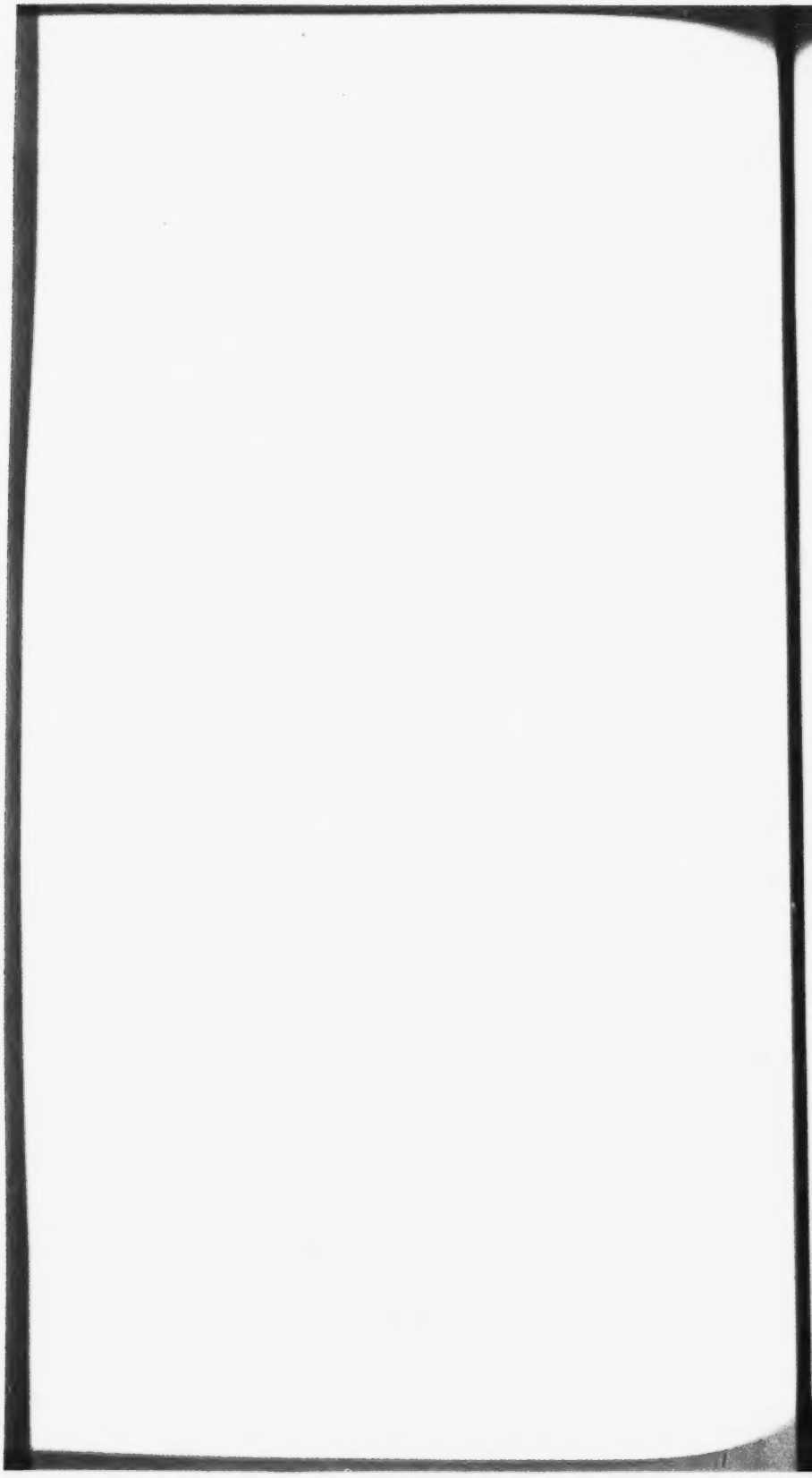
[illegible] quantity of steel forgings of Dwt. 61 and 62 to read [illegible] required" and 6 will be furnished instead of 40, as [illegible] the original order.

[illegible] factory will furnish 30 steel forgings of Dwt. 207.

[illegible] CHAIN,

R. Stewart

Purchasing Department.



Ford Motor Company

Manufacturers of Automobiles, Trucks and Tractors

Detroit, U.S.A. January 7 1924.

Jackson Shaper Co.,
Jackson, Mich.

Gentlemen:

IN REPLYING REFER TO P-69

ALL STATEMENTS OR AGREEMENTS CONTAINED IN THIS LETTER ARE CONTINGENT ON STRIKES, ACCIDENTS, FIRES OR ANY OTHER CAUSES BEYOND OUR CONTROL, AND CONTRACTS ARE SUBJECT TO APPROVAL BY THE SIGNATURE OF A DULY AUTHORIZED EXECUTIVE OFFICER OF THIS COMPANY. CLERICAL ERRORS SUBJECT TO CORRECTION.

We are enclosing, herewith, revised blue print #18-Z-3 sheet #9 Pattern "L" changed - to be used in connection with our order D-48697.

Kindly have the above order come forward per this latest revised print, advising us of any additional cost.

Please acknowledge receipt of this revised print, informing us the matter is having your attention.

FORD MOTOR COMPANY

J. Rolland Stewart

Purchasing Dept.

JRS:J P-69

Ford Motor Company

Manufacturers of Automobiles, Trucks and Tractors

Detroit, U.S.A. January 7 1924.

Jackson Shaper Co.,
Jackson, Mich.

Gentlemen:

IN REPLYING REFER TO P-69

ALL STATEMENTS OR AGREEMENTS CONTAINED IN THIS LETTER ARE CONTINGENT ON STRIKES, ACCIDENTS, FIRES OR ANY OTHER CAUSES BEYOND OUR CONTROL, AND CONTRACTS ARE SUBJECT TO APPROVAL BY THE SIGNATURE OF A DULY AUTHORIZED EXECUTIVE OFFICER OF THIS COMPANY. CLERICAL ERRORS SUBJECT TO CORRECTION.

We are enclosing, herewith, revised blue print #18-Z-3 sheet- #62 Pat. 223 changed, to be used in connection with our order D-48697.

Kindly have the above order come forward per this latest revised print, advising the writer of any additional cost.

Please acknowledge receipt of this revised print, informing us the matter is having your attention.

FORD MOTOR Co.

January 10, 1934.

Ford Motor Company
Purchasing Dept.
Detroit, Michigan.

Gentlemen; Attention J. R. Stewart.

We acknowledge your letter of January 7th with revised print #18-Z-3 sheet #9.

We will have this machine come forward per this revised print and there will be no additional cost.

Yours very truly,

Jackson Shaper Company.

LEB/MJ

General Manager.

January 10, 1924.

Ford Motor Company
Purchasing Dept.
Detroit, Michigan.

Gentlemen; Attention J. R. Stewart.

We hereby acknowledge your letter of January 7th with revised print #18-Z-3 sheet #62, detail #223 changed.

We have had this detail whic is a gear, bored and turned complete, ready to cut teeth, so it will be necessary for us to make them up again.

The labor performed on this detail amounts to $13.20 per machine. It will also be necessary to furnish us sufficient AAA steel for ten of these details #223.

Will youalso please send us two additional revised prints #18-Z-3 sheet #62.

Yours very truly,

Jackson Shaper Company.

General Manager.

Telephone Mr Stewart Jan 15 th 1924
6 H to make gears with reamed hole

Ford Motor Company

Manufacturers of Automobiles, Trucks and Tractors

Detroit, U.S.A. January 12 1924.

Jackson Shaper Co.,
Jackson, Mich.

Gentlemen:

IN REPLYING REFER TO P-69

All statements or agreements contained in this letter are contingent on strikes, accidents, fires or any other causes beyond our control and all contracts are subject to approval of the signature of a duly authorized executive officer of this company. Material ordered subject to correction

We are enclosing, herewith, revised blue print #18-Z-3 complete - (See change column) sheets 3-11-18-3-6-1, to be used in connection with our order D-48697.

Kindly have the above order come forward for this latest revised print, informing us of any additional cost.

Please acknowledge receipt of this revised print, informing us the matter is having your attention.

FORD MOTOR COMPANY

Purchasing Department.

JRS:JN

Ford Motor Company

Manufacturers of Automobiles, Trucks and Tractors

Detroit, U.S.A. January 12 1924.

Jackson Shaper Co.,
Jackson, Mich.

Gentlemen:

IN REPLYING REFER TO P-69

All statements or agreements contained in this letter are contingent on strikes, accidents, fires or any other causes beyond our control and all contracts are subject to approval of the signature of a duly authorized executive officer of this company. Material ordered subject to correction

We are enclosing, herewith, revised blue print #18-Z-3 det. 20 sheet 29 (Part T-410)(See change column) sheet 1 in connection with our order D-48697.

Kindly have the above order come forward for this latest revised print, advising the writer of any additional cost.

Please acknowledge receipt of this revised print, informing us the matter is having your attention.

FORD MOTOR COMPANY

Purchasing Department.

JRS:JN

January 14, 19..4.

Ford Motor Company
Purchasing Dept.
Detroit, Michigan.

Gentlemen; Attention J. R. Stewart.

We acknowledge receipt of your letter of January 12th enclosing revised print 18-Z-3 detail #20, sheet #29.

Inasmuch as this detail hasnbot been placed in work, there will be no additional charge.

Yours very truly,

Jackson Shaper Company.

LFR/MJ

General Manager.

January 18, 1924.

Ford Motor Company
Purchasing Dept.
Detroit, Michigan.

Gentlemen; Attention J. R. Stewart.

We hereby acknowledge your letter of January 12th enclosing revised blue prints 18-Z-3 sheets 1-2-3-6-11-18.

We had some of this work started and from conversation which we had with your tool design department last Tuesday, we will be able to bring this work through without any additional cost.

Yours very truly,

Jackson Shaper Company.

LFR/MJ

General Manager.

Ford Motor Company

HIGHLAND PARK, MICH.

ORIGINAL

Purchase Order No. D 48697

Date 1-18-24

DELIVERY REQUIRED

3 months after receipt of patterns

Jackson Stamping Company
Jackson
Michigan

F.O.B. Jackson - Prepaid

2% 20th prox or net 60 days

Our Highland Park Plant

ANY AMOUNTS SHIPPED IN EXCESS OF THE QUANTITY SPECIFIED WILL NOT BE ACCEPTED.

DESCRIPTION OF MATERIAL	PRICE
18 2 3 Complete Special Machine for Shaping (6) Cams on camshaft at one time T-410 each	$ 6,500.00

Make: (20) 19 2 M Det. 3
(10) 19 2 M Det. 6
(15) 19 2 21 Det. 29
(6) 19 2 21 Det. 15
(10) 19 2 21 Det. 19
(90) 19 2 21 Det. 21
(10) 19 2 21 Det. 19
(45) 19 2 14 Det. 2
(5) 19 2 21 Det. 17
(40) 19 2 21 Det. 10

Second party will furnish necessary castings.
First party will furnish patterns:
18 2 3 A-B-C-D-E-U6-K3-L3-M3-J3-T3-S3-G3-F3-E3-
M2-N2-I6-G3-K3-A3-S3-Y2-X2-V2-W2-T2-U2-S2-
P2-V3-Q2-R2-N2-P3-Q3-M2-N3-J2-K2-L2-M2-F2-
G2-D2-E2-S2-C2-A-B-X-Y-V-W-T-U-R-S-Q-N-P-
L-I-K-H-J-G-F.

First party will furnish (no charge)
(40) Det. 237 ready to assemble
(6) of Dets. 175-176 to assemble

(Concluded on Page 2)

CONDITIONS

This order constitutes an offer on the part of First Party upon the conditions and terms and at the prices stated herein, and to constitute a binding contract upon First Party, said offer must be accepted by execution of the acknowledgment in the form attached hereto by Second Party, it being expressly understood that no other form of acceptance, verbal or written, will be valid or binding upon First Party. There are no agreements or understandings other than those embodied in this order.

No charges will be allowed for crating, boxing or drayage unless stated herein.

Materials purchased are subject to First Party's inspection and approval and if rejected, will be held at Second Party's risk and returnable at Second Party's expense.

All invoices must be rendered in duplicate, prices and extensions to appear on original only. Separate invoices required for each individual shipment. Original bills of lading or express receipts, etc., properly signed by carrier representative, must be attached to the Second Party's invoices and both mailed to Ford Motor Co., Detroit, Mich., Attention Purchasing Department, not later than day after shipment. In case shipments are consigned to the First Party's Branch Assembly Plants, original bills of lading should be sent to the branch, while the shipping duplicates should be forwarded to Detroit, Mich., with the Second Party's invoices.

First Party will not receipt for materials unless accompanied by packing slips. Original packing slips for carload lots must be enclosed in envelope (unsealed), addressed to Ford Motor Co., and tacked inside car door. Original packing slips for L. C. L. shipments must be placed in each package. Copies relating to ALL shipments to be mailed direct to Ford Motor Co., at point of destination, "Attention Receiving Room."

To insure settlements as agreed, statement of account should be rendered monthly, in time to reach the First Party by the 25th proximo.

First Party reserves the right to cancel this order or any part thereof, if material is not shipped according to deliveries above specified, or for causes due to any acts or demands of the United States Government, or to fires, strikes, or other causes beyond First Party's control, or if material is not in accordance with blue prints, approved samples or specifications, or is defective in workmanship or material, or is not satisfactory to First Party.

Second Party guarantees that the sale or use of its products will not infringe any United States or foreign patent, and undertakes to indemnify First Party against all judgments, decrees, costs and expenses resulting from such alleged infringement, and covenants that Second Party will upon request of First Party and at Second Party's own expense, defend, or assist in the defense of, any suit or action which may be brought against First Party or those selling or using any products of First Party by reason of any alleged infringement of any patent in the sale or use of Second Party's products.

The price herein specified is based on present rate of freight and any reduction in present freight rates is to be credited to the account of the First Party.

Ford Motor Company

By _____
Purchasing Dept.

Purchase Order No. D 48697

Ford Motor Company

HIGHLAND PARK, MICH.

Page No. 2 Continued from Page No. 1 Purchase Order No. D 48697

Ordered From Jackson Shaper Company Date 1-18-24

DESCRIPTION OF MATERIAL

(Continued - first party will furnish (no charge)):

(5) 19 Z 51 Oil boxes with oil gauges.
(40) 19 Z 25 Int. 6
(5) pcs 3611 Diamond Cable Chain 76" long
(5) pcs 5/8 pitch 1/4" wide Roller Chain Dia of roller .400"
Necessary stud for (5) dets. 1-25-26-41-43-66-129-132-133-228
(40) of Dets. 58-61-62-64
(1[illegible]) of Dets. 65-179-206-223
(20) of Dets. 97-95
Also will ship pattern 19 Z 3-V-3

All patterns are placed with the second party strictly at the second party's risk, fob second party's plant charges fully prepaid. On completion of orders, return patterns fob first party's plant, charges fully prepaid. In case of destruction by fire or otherwise, replacement must be made at second party's expense. The first party will not assume responsibility for patterns while in the second party's possession.

Per your quotation 12-11-23, our inquiry # 42584

Confirming telephone order to Mr. Broughton 12-12-23

Mark and Consign: HIGHLAND PARK PLANT
Ford Motor Co
(for order D 48697)
Detroit Mich

JHS HSS
72884
M 1-19
PO X-59530
Req. 16362

Ford Motor Company By J. Rolland Stewart
Purchasing Dept.

Purchase Order No. D 48697

CLASS OF SERVICE SYMBOL

TA

Day Letter | Blue

Night Message | Nite

Night Letter | N L

If none of these three symbols appears after the check number of words, this is a telegram. Otherwise its character is indicated by the symbol appearing after the check.

WESTERN UNION TELEGRAM

NEWCOMB CARLTON PRESIDENT GEORGE W E ATKINS FIRST VICE PRESIDENT

CLASS OF SERVICE SYMBOL

T

Day Letter | Blue

Night Message | Nite

Night Letter | N L

If none of these three symbols appears after the check number of words, this is a telegram. Otherwise its character is indicated by the symbol appearing after the check.

RECEIVED AT

27Z X 12 1 EXTRA

FD DETROIT MICH 1035A JAN 21 1928

JACKSON SHAPER CO

JACKSON MICH

OK MAKE EIGHTEEN Z THREE DETAIL FIFTY TWO OF TOOL STEEL

FORD MOTOR CO STEWART

1047A

Ford Motor Company

Manufacturers of Automobiles, Trucks and Tractors

Detroit, U.S.A.

Jackson Shaper Co.,
Jackson
Michigan

Jan 21 1928

ATTENTION - Mr. Broughton

Gentlemen: Purchase Order P-69

ALL STATEMENTS OR AGREEMENTS CONTAINED IN THIS LETTER ARE NOT BINDING ON THIS COMPANY UNLESS CONFIRMED BY ITS PURCHASING DEPARTMENT. ALL CONTRACTS ARE SUBJECT TO APPROVAL BY THE EXECUTIVE OFFICES OF THIS COMPANY.

This will confirm our telegram to you today, authorizing you to make 18-Z-3 detail 52 of tool steel. We believe it will work out to better advantage making this part of tool steel than of triple "X" steel as specified on our order. You will remember this is the part that you talked over with our toolmaker when last at our office, with reference to the hardness on the ends where the wear would come.

NOT VALID UNLESS COUNTERSIGNED BY

J Rousmaniere

Purchasing Department

JRS:ETS

Ford Motor Company

Manufacturers of Automobiles, Trucks and Tractors

Detroit, U.S.A. January 22 1924.

Jackson Shaper Company
Jackson, Michigan.

Gentlemen:

IN REPLYING REFER TO P-69

ALL STATEMENTS OR AGREEMENTS CONTAINED IN THIS LETTER ARE CONTINGENT ON STRIKES, ACCIDENTS, FIRES OR OTHER CAUSES BEYOND OUR CONTROL. CONTRACTS ARE SUBJECT TO APPROVAL BY THE SIGNATURE OF A DULY AUTHORIZED EXECUTIVE OFFICER OF THIS COMPANY.

We are enclosing, herewith, revised blue print #10-2-3 sheet #40 [illegible] M3 changed, to be used in connection with our order D-48697.

We are also enclosing revised blue print #[illegible] sheet #55 to be used in connection with order D-48697.

Kindly have the above order come forward [illegible] latest revised print, advising the writer of any additional cost.

Please acknowledge receipt of these revised prints, informing us the matter is having your attention.

FORD MOTOR COMPANY
Purchasing Department

JPS:M

1450

FORD FORM 1250

Contractor's Material Order

Contractor's Copy
To be Retained by Contractor

THE FORD MOTOR COMPANY of Highland Park Michigan
Seller, agrees to sell

Order No. R [illegible]
Date 1-25-24.

And Jackson Shaper Co.,

of Jackson, Mich.

Buyer, agrees to buy and accept materials specified below subject to the terms and conditions stipulated:

SHIP VIA Exp

TERMS 30 Days Net from Date of Shipment

F. O. B. Cars, Railroad Point of Delivery

Refer to Ford Motor Co.
Order No. D-48697

QUANTITY	SYMBOL		PRICE
6	18-2-3	Jax Shaper Machine - AAA Steel Forgings	
		for 18-2-3 Detail 96	
		Material -	at cost
		Labor - per hr	1.25
J38 FD			
FBO W 9485			

CONDITIONS

1. Title and right to possession of said material shall be and remain in Seller until paid for in full.
2. All such material where title and right to possession have not passed to Buyer shall be held at Buyer's risk and shall [illegible] be insured at Buyer's expense in an amount and company to be approved by the Seller.
3. In case the Seller shall deem itself insecure in obtaining performance of this contract, it may terminate same without notice and retake possession of all such material, where title and right to possession have not passed to Buyer, with or without legal process.
4. Where title and right to possession have not passed to Buyer it is agreed that Buyer will keep said material separate and apart, marked "Property of Ford Motor Company," so that it may be readily identified. Said material shall not be removed from Buyer's plant unless on written direction of Seller, except for purposes of fabrication.
5. Buyer will, at all reasonable times, keep separate account of such material, as kept separate and apart, where title and right to possession have not passed to Buyer, and will furnish reasonable statements on request giving detailed description and location of such material as well as any other information asked for by Seller. Seller shall have right at all reasonable times to check and inspect such material and Buyer's records thereof.
6. Buyer [illegible] waives any lien that he has or may hereafter have on such material.
7. [illegible] form shall govern construction of this contract.

IMPORTANT

[illegible] this [illegible] and return immediately by mail to [illegible] Co., Detroit, Michigan.

Buyer

By

Title of Person

Order No. R 22026

Ford Motor Company

Manufacturers of Automobiles, Trucks and Tractors

Detroit, U.S.A.

Jackson Shaper Co
Jackson
Mich

Gentlemen: In replying refer to P-60.

We wish to call your attention to the following

D-48697 D-48678.

Inasmuch as we are in urgent need of the above, we request that you do all in your power to shimmin or hasten dates specified on the above orders.

An expression from you concerning the above will

FORD MOTOR COMPANY.

Purchasing Agent.

JTG'iH.

Ford Motor Company

Manufacturers of Automobiles, Trucks and Tractors

Detroit, U.S.A.

Jackson Shaper Co
Jackson
Mich

February 8 19[illegible]

Gentlemen: In replying refer to Mr A H Wibel

Kindly give us, when completed, for record purposes, the net weight of the special Machine for shaping cams on camshaft, covered by our order D-48697, our Requisition #16968.

FORD MOTOR COMPANY
Engineering Dept

February 12, 1924.

Ford Motor Company
Purchasing Dept.
Detroit, Michigan.

Gentlemen; Attention J. R. Stewart.

We have just received one pattern and core box marked 18-2-5 - M5 and we cannot find any blue print covering this piece, neither can we find it on the assembly drawing.

Will you please look into this and send us blue print showing this pattern.

Yours very truly,

Jackson Shaper Company.

LKP/MJ

General Manager.

Ford Motor Company

Manufacturers of Automobiles, Trucks and Tractors

Detroit, U.S.A.

Jackson Shaper Company
Jackson
Michigan

February 19 1924

Gentlemen: Replying refer to P-12-2

All statements or agreements contained in this letter are subject to strikes, fires, floods or any other causes beyond our control, and all contracts are subject to approval by the General Office of the Company. Credit orders subject to correction

Referring to purchase order D-46617 covering 6 only 18-2-S complete special machines for shaping 8 cams on camshaft at one time.

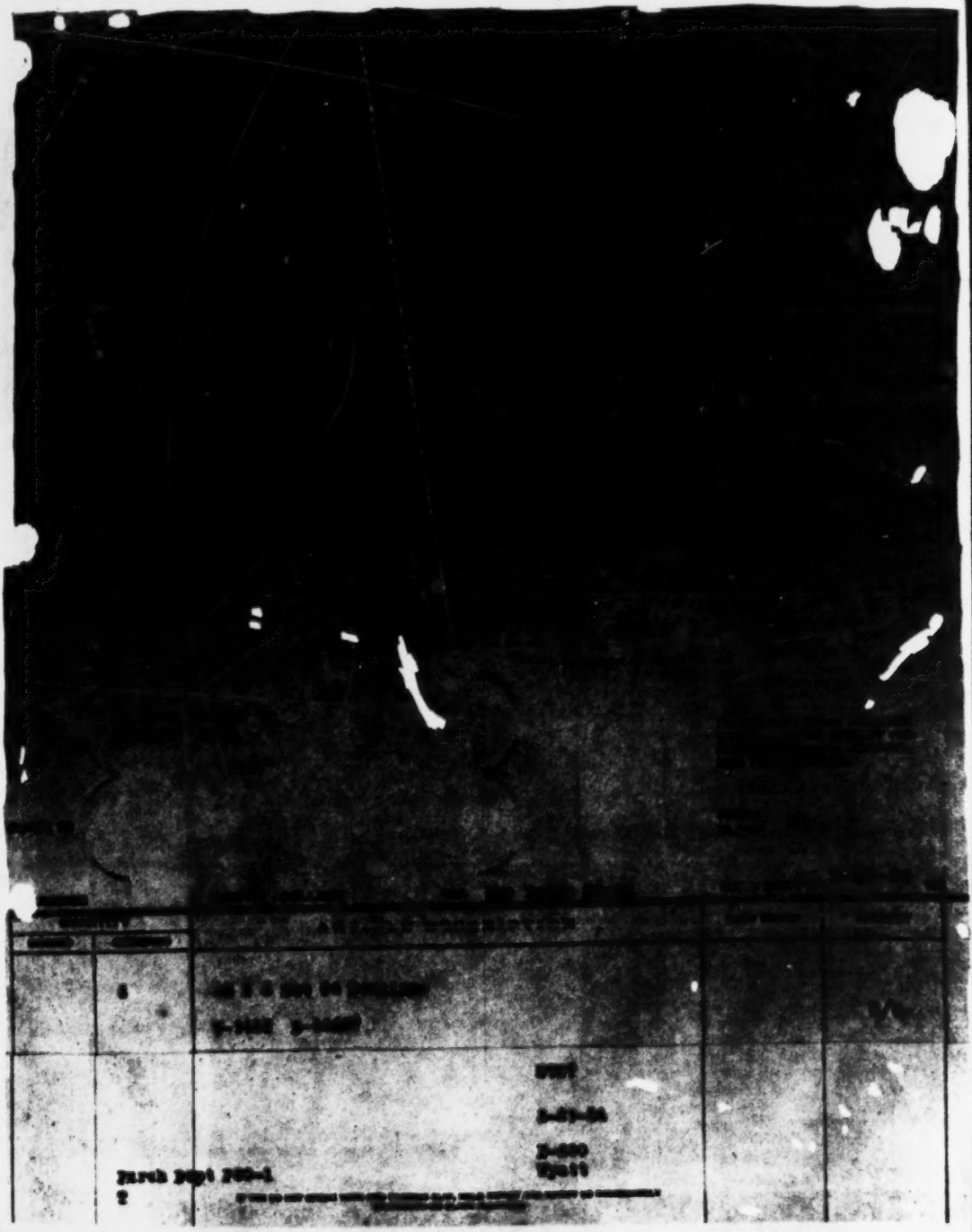
Kindly expedite the matter of obtaining your castings from patterns 18-4-3F 2, and 18-2-3A 2 which were delivered to you on delivery order #50912 on Feb 4th, 1924.

It is necessary that we have these patterns at the earliest possible moment in order that we may obtain castings for the repairs on machines which are down at the present time.

Kindly ship these patterns by express, addressed for the attention of Mr. Hodges, Casting Stock, Highland Park plant.

[illegible]

[illegible]



March 4, 1924.

Ford Motor Company
Purchasing Dept.
Detroit, Michigan.

Gentlemen; Attention J. R. Stewart.

We have had nine hours pattern work, amount $11.25 on your order #16-Z-3, as you no doubt remember some of the patterns were sent to us in a broken condition.

Willyou please advise us that it will be all right to add this amount to your order #D-48697.

Yours very truly,

Jackson Shaper Company.

LFF/WJ

General Manager.

Form 1507

Ford Motor Company

CHANGE NOTICE Date 3-5-24

Please note we have made the following change on indicated purchase order issued in your favor.
Kindly correct your records accordingly acknowledging receipt by return mail

Firm Jackson Shaper Co.

Rec. Memo. Date

PO. D-48697 RA Symbol 18 X 3

MATERIAL Machines for shaping cam shafts

YOU ARE AUTHORIZED TO MAKE THE FOLLOWING CHANGE:

Price—from to add 11.25 ea

Terms—from to

Specifications—from to

Quantity—from to

REASON Cost of repairing patterns furnished by Ford Motor Co.

Change Item	Case No.	Weight
		From To

RECEIVING DEPT.—If in order make change indicated.

O. K. Signed J R Stewart Department

Change on Memo.

March 25,1924.

Ford Motor Company,

Detroit, Mich.

Gentlemen: Attention Mr. J.R.Stewart

Complying with your request of yesterday, we submit herewith cost figures on Machine 18 ℄ 3 your order D48697. Work on this order has been held up, awaiting your further instructions.

Yours very truly,

JACKSON SHAPER COMPANY

LEB/L General Manager

March 24,1934.

Time and material on Cam Machine 18 ℄ 3 to date.

Iron Castings	26,250 #	$ 1,575.83
Bronze	2,374 #	712.62
Steel Castings	5,390 #	565.35
Steel Forgings		506.75
C.R. & Mach Steel		257.87
Tool Steel		88775
Screws & Nuts		14.73
Drill Rod		3.87
Pattern Work		37.37
Gear Cutting		186.35
Special Tools		118.07
Tubing		6.15
Heat Treating		30.50
Sprockets		17.00
Miscellaneous		175.95
Total Material		4276.16
Plus 10%		427.61
Freight		194.00
Labor, 10,217½ hours @$1,50		15326.25
		20224.02

Form 1207

Ford Motor Company

CHANGE NOTICE Date 3/12/24

Please note we have made the following change on indicated purchase order issued in your favor.
Kindly correct your records accordingly acknowledging receipt by return mail.

Firm Jackson Shaper Co.

Rec. Memo. Date

Dept. PO D-48697 RA Symbol 18-2-3

MATERIAL Machine for shaping cams.

YOU ARE AUTHORIZED TO MAKE THE FOLLOWING CHANGE:

Price—from Add a $231.81 to lot to

Terms—from to

Specifications—from to

Quantity—from to

REASON Cost of changing 5 pcs. det. 1 - 10 pcs. det. [illegible]
from 3-4 steel to tool steel - per our instructions [illegible]

Change Item letter 3/10/24 Case No. From Weight

RECEIVING DEPT.—If in order make change indicated.

O. K. Signed JRS: JM P-69 Purch.

Ford Motor Company

Manufacturers of Automobiles, Trucks and Tractors

Detroit, U.S.A.

March 24 1924.

Jackson Shaper Company
Jackson
Mich
Gentlemen: EMPLOYEES REFER TO P-82-1.

Kindly expedite the matter of obtaining your castings from pattern 18-2-3 S-2, which we delivered to you under date of December 17th, 1923, on our D.O. 66811, to be used in connection with purchase order D-48697.

It is necessary that we have these patterns at the earliest possible moment in order that we may obtain castings for the repairs of machines which are down at the present time.

Kindly ship this pattern via express addressed for the attention of Mr. Hodges, Castings Stock, Highland Park Plant, advising the writer the date shipment leaves your plant.

FORD MOTOR COMPANY.

[illegible] Purchasing Department.

[illegible].

March 26, 1924.

Ford Motor Company
Purchasing Dept.
Detroit, Michigan.

Gentlemen: Attention M. A. Belknap.

We acknowledge your letter of March 24th and will return this pattern to you within the next few days.

Yours very truly,

Jackson Shaper Company.

LFB:MJ

General Manager.

March 30, 1924.

Ford Motor Company
Purchasing Dept.
Detroit, Michigan/

Gentlemen; Attention J. R. Stewart.

We have made up the following parts on the 18-Z-3 machine which were changed from triple "A" steel to tool steel;

5 - Detail #1.
10 - " 179.
40 - " 52.

210 lbs. tool steel		$57.75
139-1/4 hrs. Labor @	$1.25.-	174.06
	Total	$231.81

Total to apply against your order # D-48697.

Yours very truly,

Jackson Shaper Company.

LFB/MJ

General Manager.

Ford Motor Co.

Dearborn, Mich.

Jackson Shaper Co
Jackson
Mich

Gentlemen:

All statements or agreements contained in this letter are conditioned on strikes, accidents, delays, contingencies and causes beyond the control of the Company. This letter is subject to approval by the Executive Committee of the Company and shall not be binding upon the Company until approved by such Committee.

Attached you will find our check for $ to apply on account.

FORD MOTOR COMPANY

E Fuller
Auditor of Disbursements

April 8, 1920

Ford Motor Company
Auditor of Disbursements
Detroit, Michigan.

Gentlemen; Attention E. Fuller.

We acknowledge with thanks your letter of April 5th enclosing check for $10000.00 on account.

Yours very truly,

Jackson Shaper Co.

LFR:WJ

General Manager.

1460

April 22, 1924.

Ford Motor Company
Purchasing Dept.
Detroit, Michigan.

Gentlemen; Attention J. R. Stewart.

Please refer to your order #D-48697 covering five machines 18-B-3 for machining cam shafts.

It is now four weeks since you had us stop work on this order and we would very much appreciate a word from you as to the disposition of the order or material on hand.

Yours very truly,

Jackson Shaper Company.

LFB/MJ

General Manager.

Ford Motor Company

Manufacturers of Automobiles, Trucks and Tractors

Detroit, U.S.A.

Jackson Shaper Company
Jackson
Mich

April 24 1924

Attn. Mr. Broughton

Gentlemen:

IN REPLYING REFER TO P-69

ALL STATEMENTS OR AGREEMENTS CONTAINED IN THIS LETTER ARE CONTINGENT ON STRIKES ACCIDENTS FIRES OR ANY OTHER CAUSE BEYOND OUR CONTROL AND ALL CONTRACTS ARE SUBJECT TO APPROVAL BY THE SIGNATURE OF A DULY AUTHORIZED EXECUTIVE OFFICER OF THIS COMPANY

Acknowledging your letter of April 7th with reference to order #D-48697 for 5 machines 18B-3 are pleased to inform you that Mr. Duffy has this matter up with our Superintendent's office and expects to be able to give you disposition of this material sometime within the next week.

Thanking you for drawing this to our attention, we are

FORD MOTOR COMPANY
J. Rollan Stewart
Purchasing Department

JRS:AO

Ford Motor Company

Manufacturers of Automobiles, Trucks and Tractors

Detroit, U.S.A.

Jackson Shaper Company
Jackson
Mich

April 24 1924

Attn. Mr. Broughton

Gentlemen: IN REPLYING REFER TO P-69

ALL STATEMENTS OR AGREEMENTS CONTAINED IN THIS LETTER AND CONTINGENT UPON STRIKES ACCIDENTS DELAYS OR OTHER CAUSES BEYOND OUR CONTROL AND ALL ORDERS TO AND CONTRACTS ARE NOT BINDING UNTIL APPROVAL BY THE MANAGER OF THE DEPARTMENT AUTHORIZED TO BUY OR BY AN OFFICER OF THIS COMPANY. CLERICAL ERRORS SUBJECT TO CORRECTION

The writer is surprised to learn that you still have in your possession all of the patterns for machine 18s-412. These machines you built for us you delivered along the later part of February and the patterns should have been returned at that time or prior thereto. Right now we are very anxiously in need of patterns X and W so wired you today to return by electric freight all of the patterns for this job, marking the same for Castings stock Department and sending them to our Highland Park plant.

Along the line of patterns you may use this as your authority to return to us the patterns for machine 18Z-3, these patters may be boxed and returned to our Rouge plant, B Building. Please see that this is properly taken care of.

FORD MOTOR COMPANY

J. Rolland Stewart

PURCHASING DEPARTMENT

JR:AO

April 26, 1924.

Ford Motor Company
Purchasing Dept.
Detroit, Michigan.

Gentlemen; Attention J. R. Stewart.

We acknowledge your letter of April 24th confirming your telegram regarding patterns 18-Z-412.

These went forward on the 24th and the 18-Z-3 patterns will be shipped either today or Monday.

We regret that the 18-Z-412 patterns were not returned sooner and will keep a closer tab on the return of patterns in the future.

Yours very truly,

Jackson Shaper Company.

Ford Motor Company,

Manufacturers of Automobiles Trucks and Tractors

Detroit U.S.A. April 28, 1924

Jackson Shaper Company,
Jackson,
Michigan

Attention - Mr. L. E. Broughton

Gentlemen:

D-16

We are authorizing our Disbursement Department to honor your Invoice for $20,224.02 to cover Material, Freight and Labor to time of cancellation of our Order D-48697 covering 5 Cam Shapers as per blueprint 18 - Z - 3. We are however, also instructing the above Department to deduct from your account $219.52: This amount being the salvage and freight you advised you would allow providing we left the material at Jackson, and arrived at as follows:

Bronze	1000 lbs. @	.13	$130.00
"	338 "	.30	101.40
Cast Iron	2200 "	.01	220.00
" Steel	2000 "	.005	10.00
Steel Shaft etc.	2000 "	.01	20.00
	Total.....		$ 481.40
Plus allowance for Freight			138.12
Grand Total.....			$ 619.52

Kindly advise by return mail if this is in accordance with your understanding.

FORD MOTOR COMPANY,

Purchasing Department

k

April 29, 1924.

Ford Motor Company
Purchasing Dept.
Detroit, Michigan.

Gentlemen; Attention H. A. Duffey.

We acknowledge your letter of April 28th regarding your order #D-48697 covering five Cam Shapers 18-2-3.

The disposition of material by us and deduction of $619.52 from our account is in accordance with our previous conversation with your Mr. Stewart when he was here and checked up the job.

Yours very truly,

Jackson Shaper Company.

LFB:MJ

General Manager.

Ford Motor Company

No. 679276	ACCOUNT NO.	DEPT. CHG.	FACTORY WORK ORDER NO.	APPROVE
679276	270	410	E-6[illegible]31	D.

ASSIGNED	CAST IRON	STEEL	NI CHROME	BRONZE	AL BRONZE	ALUMINUM	BRASS

Z NUMBER	DETAIL	PART NO	PATTERN NUMBER	PATT. LETTER

-.-.35472 ve. ul for -6250.

-.69
-.15
-.00
-71.-
G.
Adams
Al.Smith
Brown
Ayers.

Mov. Rolling Stn Le ne o.-. 35472 from K-7 Motor Plat.
(assigned to -6250) to N-5 Foundry.

-ven al for oper. 1[illegible] ; chin was on -6250 Crankshaft.

REASON o . -ayers.

DATE	REQUESTED BY	OF DEPT.	LOCATION	FOR DEPT.	LOCATION OF JOB	SUPT. O. K.
6-3-29	J.Herriots	N-11 A	-[illegible].	41^	K. to Plat.	

Form 2061
3-29-11-12-28

PLAINTIFF'S EXHIBIT NO. P-1

Ford Motor Company

No. 144431	ACCOUNT NO.	DEPT. CHARGE	FACTORY WORK ORDER NO.
	270	410	E-6-3-75

THESE SPACES TO BE USED FOR ORDERING CASTINGS

ASSIGNED	NO. WANTED	KIND OF METAL	PATTERN NO.	DELIVERED

NO. WANTED	Z OR S NUMBER	DETAIL	PATTERN	FORGING	S. P.

~~N-[illegible]~~ Please move cam lathe 36592
N-316 from K-7 to N-711-C Foundry
N-306 O.K. FILE Tool Room.
N-316 Disconnect all pipes XX Rush
N-711C-Overhaul to put in reliefs they
REASON To be repaired for R-6250

DATE	REQUESTED BY	DEPT.	LOCATION	FOR DEPT.	LOCATION OF JOB	SUPT'S O. K.
11/14		410	F-6	410	K-7	

FORM 2062
3-29-11-12-28

PLAINTIFF'S EXHIBIT NO. P-2

Ford Motor Company

SERIAL	ACCOUNT NO.	DEPT. CHG.	FACTORY WORK ORDER NO.	APPROVE
№ 679429 679429	270	410	E16827	D.

ASSIGNED	CAST IRON	STEEL	NI CHROME	BRONZE	AL BRONZE	ALUMINUM	BRASS
	Z-NUMBER		DETAIL	PART NO.	PATTERN NUMBER		PATT. LETTER

B.T. 36928 Overhaul for A-6250.

N-711-C
N-309
N-316
N-700

CC

Kellogg
Al.Smith
Myers.

W.T.

Move Milling Cam Lathe B.T. 36928 from A-8 Motor Bldg. (Assigned to A-6250) to B-58 Fdry.

Overhaul for Opr. #13; Turn Cam on A-6250 Camshaft.

SPECIAL AUTH

SEP 13 1929

O.K. FILE

REASON

DATE	REQUESTED BY	OF DEPT.	LOCATION	FOR DEPT.	LOCATION OF JOB	SUPT. O. K.
7-3-29	R.Herklots	B-519-A	B-Bldg.	410	Motor Bld'g.	

Form 2003 8M32—11-16-28

PLAINTIFF'S EXHIBIT NO. P-3

Ford Motor Company

SERIAL	ACCOUNT NO.	DEPT. CHG.	FACTORY WORK ORDER NO.	APPROVE
№ 758115 758115	270	410	E34478	Dc

ASSIGNED	CAST IRON	STEEL	NI CHROME	BRONZE	AL BRONZE	ALUMINUM	BRASS
	Z-NUMBER		DETAIL	PART NO.	PATTERN NUMBER		PATT. LETTER

B.T. 36812

N-711-C
N-309
N-316

CC

Kellogg
A.Smith
Myers.
Hill

Move Milling Cam Lathe B.T. 36812 from K-7 Motor Bldg. (Assigned to A-6250) to B-58 Fdry.

Overhaul for opr. #13; turn cams on A-6250 Camshaft.

O.K. FILE

REASON Req. Auth.

DATE	REQUESTED BY	OF DEPT.	LOCATION	FOR DEPT.	LOCATION OF JOB	SUPT. O. K.
8-23-29	R. Herklots	[illegible]	B-Bldg.	410	Motor Bldg.	

Form 2003 8M32—11-16-28

PLAINTIFF'S EXHIBIT NO. P-4

Ford Motor Company

SERIAL	ACCOUNT NO.	DEPT. CHG.	FACTORY WORK ORDER NO.	APPROVED
Nº 791519	270	410	E-40938	Dc

ASSIGNED	CAST IRON	STEEL	NI CHROME	BRONZE	AL BRONZE	ALUMINUM	BRASS

Z NUMBER	DETAIL	PART NO.	PATTERN NUMBER	PATT. LETTER

V-316 Disconnect all pipes and meters on Milling Cams for No. 37754 and move to from K-7 Left 410 to B-55-N-711C

N-711C Make all necessary repairs on Milling Cams for No. 37754

MAR 28 1930

3 to Left Hand

REASON

DATE	REQUESTED BY	OF DEPT.	LOCATION	FOR DEPT.	LOCATION OF JOB	SUPT. O. K.
3/27/30	Meyers T	410	T-5	410	K-7	

PLAINTIFF'S EXHIBIT NO. P-5

Ford Motor Company

SERIAL	ACCOUNT NO.	DEPT. CHG.	FACTORY WORK ORDER NO.	APPROVED
Nº 867317 867317	270	410	E-40938	Dc

ASSIGNED	CAST IRON	STEEL	NI CHROME	BRONZE	AL BRONZE	ALUMINUM	BRASS

Z-NUMBER	DETAIL	PART NO.	PATTERN NUMBER	PATT. LETTER

B.T. 38005

K-316
K-309
K-711-C

CC

Kellogg
A.Smith
C.Hill
Meyers
Myers.

Move Milling Cam Turning Lathe B.T. 38005 from K-7

Motor Mldr. (assigned to A-6280) to B-55 Fdry.

APR 10 1930

Overhaul for opr. #13: turn cams on A-425C Camshaft.

O. K. FILE

REASON Mgr. E. Myers.

DATE	REQUESTED BY	OF DEPT.	LOCATION	FOR DEPT.	LOCATION OF JOB	SUPT. O. K.
10-18-29	E. Hawkins	K-519-A	B-Bldg.	410	Motor Bldg	

PLAINTIFF'S EXHIBIT NO. P-6

Ford Motor Company

Nº 14087 R | Account No. 270 | Dept. Chg. 410 | P54299 R

Assigned	Cast Iron	Steel	Ni Chrome	Bronze	Al. Bronze	Aluminum	Brass

X-Number	Detail	Part No.	Pattern Number	Patt. Letter

50

B2-37887

N-316
N-309
N-711-C
CC

Kellogg
Asmith
S.Hill
Myers.

Move Melling Cam Turning Lathe B2-37887 from E-7 Motor Bldg. (assigned to A-6250) to B-58 Dry.

Overhaul for opr. #13: Rough turn cams on A-6250 Camshaft.

APR 8 1930

Reason

Date	Requested By	Of Dept.	Location	For Dept.	Location of Job
1-27-30	E.Merkle	B-519-A	B-21[illegible]	410	Motor 31 dry.

PLAINTIFF'S EXHIBIT NO. P-7

Ford Motor Company

Approved by [illegible] | Nº 44067 | Account No. 270 | Dept. Charge 410 | E 58355

Assigned	No. Wanted	Kind of Metal	Pattern No.	Deliver To

These spaces to be used for ordering castings

No. Wanted	X or B Number	Detail	Pattern	Forging	S. P.

B.T. 36457

N-316 - Disconnect motor & pipes
Move to B-60 - Foundry Tool Room
N-711C

N-711C - do all necessary repairs to put machine in first class shape

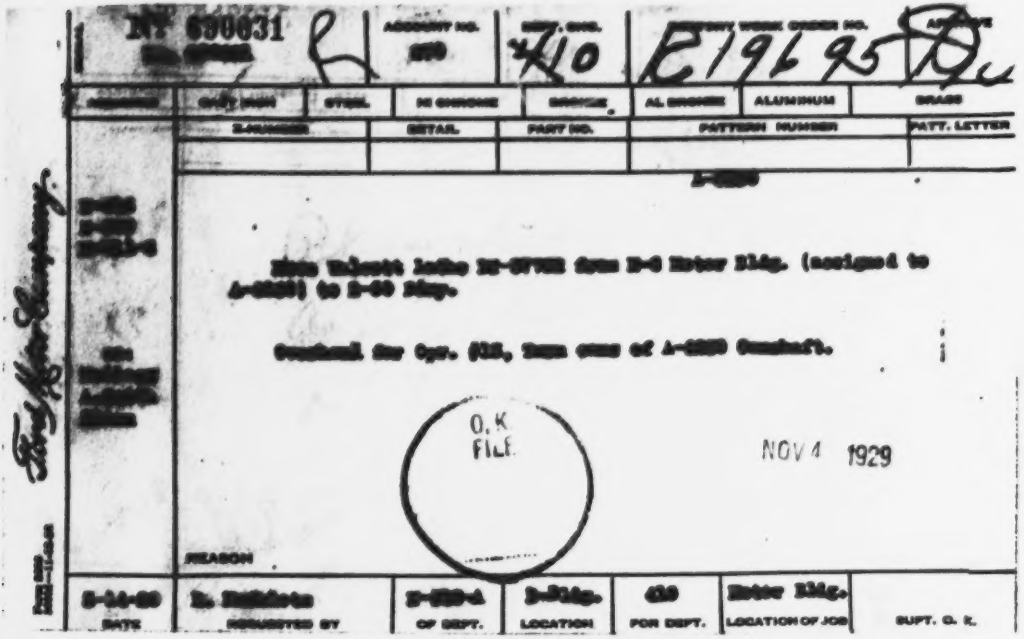
O.K. FILE

NOV 1 1928

Reason Machine worn and C.9. Bracket broken

Date	Requested By	Of Dept.	Location	For Dept.	Location of Job	Supt's O. K.
9-5	Aekley	410	J-7	410	J-7	

PLAINTIFF'S EXHIBIT NO. P-8



Ford Motor Company

No. 690631

410

E19695

Make Universal lathe 32-67925 from B-6 Motor Bldg. (assigned to A-6250) to B-60 Bldg.

Overhaul for Oper. #15, Same area of A-6250 Contract.

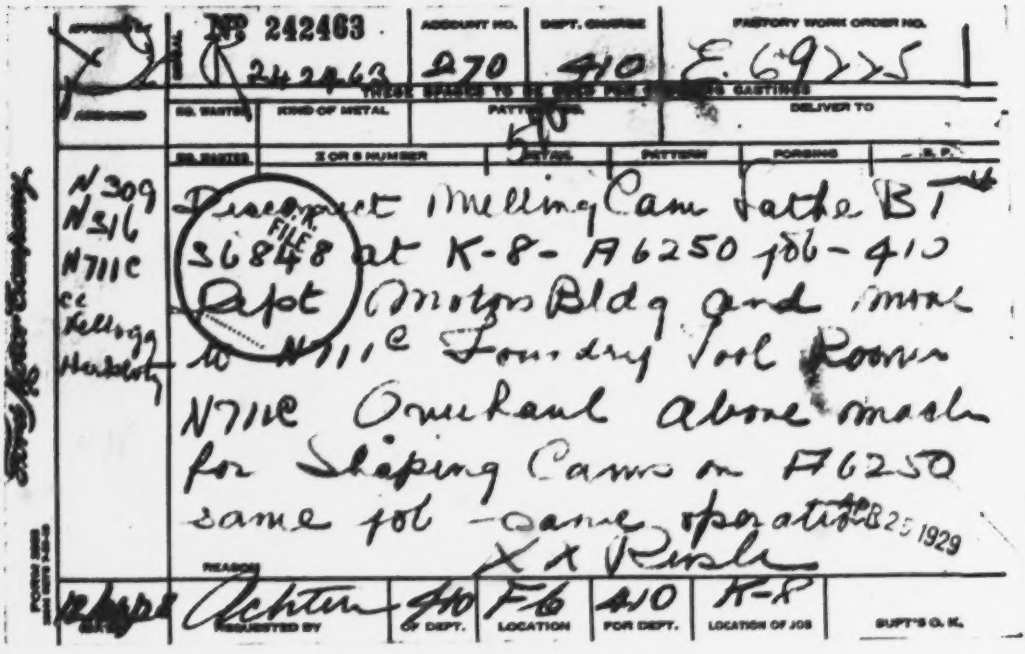
O. K. FILE

NOV 4 1929

REASON

5-14-29 DATE — L. Robbins REQUESTED BY — B-620-A OF DEPT. — B-60 Bldg. LOCATION — 410 FOR DEPT. — Motor Bldg. LOCATION OF JOB — SUPT. O. K.

PLAINTIFF'S EXHIBIT NO. P-9



Ford Motor Company

No. 242463

242463

270

410

E-6925

THESE SPACES TO BE USED FOR STORES CASTINGS

NO. MASTER — KIND OF METAL — PATTERN NO. — DELIVER TO

NO. MASTER — X OR S NUMBER — DETAIL — PATTERN — FORGING — S. P.

N309
N316
N711C
cc Kellogg
Hudson

FILE 36848

Discontinue Milling Cam Lathe BT at K-8-A6250 job-410 Dept Motors Bldg and move to N711C Foundry Tool Room N711C Overhead above mash for Shaping Cams on A6250 same job - same operation

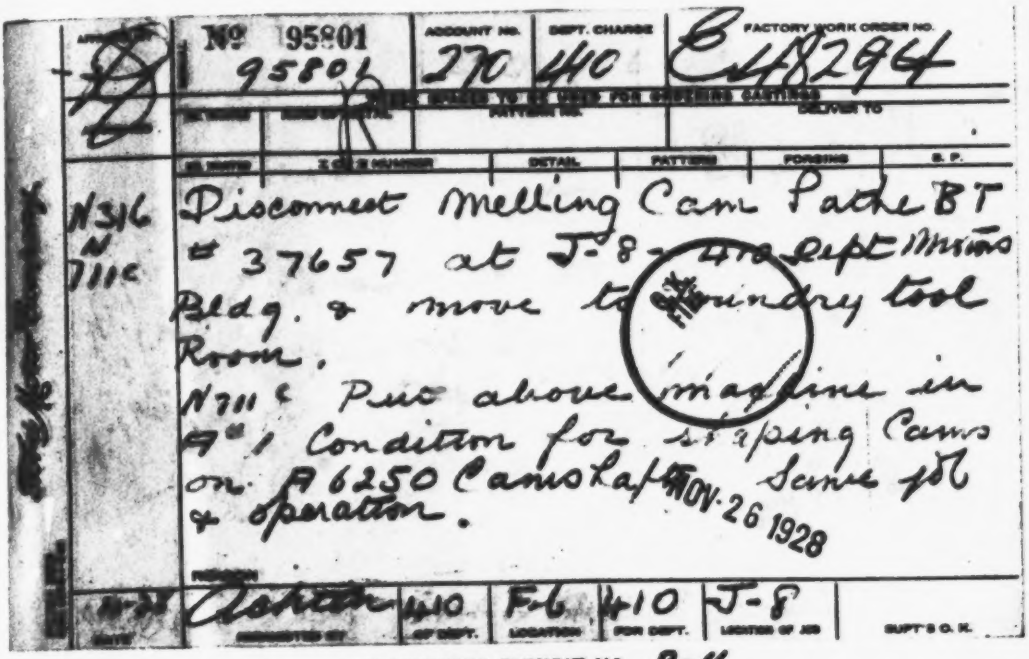
NOV 25 1929

X X Rush

REASON

Change — Achten REQUESTED BY — 410 OF DEPT. — F-6 LOCATION — 410 FOR DEPT. — K-8 LOCATION OF JOB — SUPT'S O. K.

PLAINTIFF'S EXHIBIT NO. P-10



No 95801 | 95801 | 170 | 440 | C48294

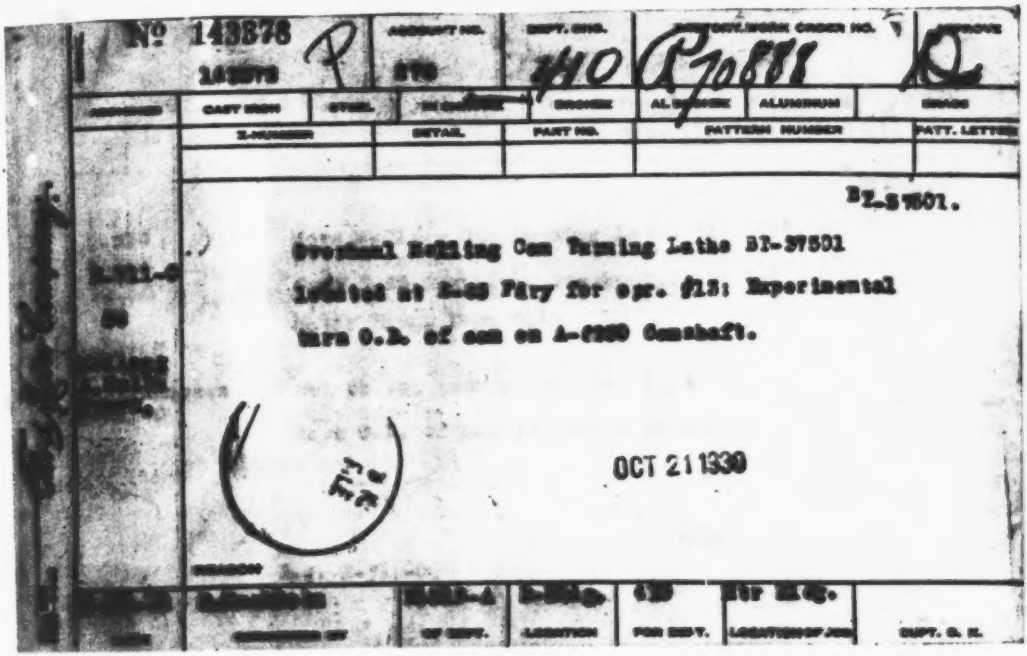
N316 Disconnect Melling Cam Pathe BT # 37657 at J-8 - 440 Dept Mains Bldg. & move to Foundry tool Room.

N711 Put above machine in 4th Condition for shaping Cams on A 6250 Camshaft. Serve for operation.

NOV 26 1928

11-28 | Clarke | 440 | F-6 | 440 | J-8

PLAINTIFF'S EXHIBIT NO. P-11



No 143878 | 143878 | P | 440 | P70888

BT-37501.

Overhead Melling Cam Turning Lathe BT-37501 located at E-23 Fury for opr. #13: Experimental turn O.D. of cam on A-7250 Camshaft.

OCT 21 1930

PLAINTIFF'S EXHIBIT NO. P-12

Ford Motor Company

APPROVED BY | SERIAL | No. 390989 | ACCOUNT NO. 270 | DEPT. CHARGE 410 | FACTORY WORK ORDER NO. R-7818

ASSIGNED | THESE SPACES TO BE USED FOR ORDERING CASTINGS | NO. WANTED | KIND OF METAL | PATTERN NO. | DELIVER TO

NO. WANTED | Σ OR S NUMBER | DETAIL | PATTERN | FORGING | S. P.

731C — [illegible] comm. Lathe R6250 No 37501

O.K. FILE 4234 — [illegible] + move to F. T. Room N711C.

N711C — [illegible] + put on first class [illegible] 1929 [illegible] to be used on same operation as now on Dept 410 Motor Bldg.

Ch Engrs

REASON

11/22/29 DATE | H. Klamm | [illegible] OF DEPT. | F-7 LOCATION | 410 FOR DEPT. | [illegible] | SUPT'S O. K.

FORM 3003 SEE OTHER SIDE

PLAINTIFF'S EXHIBIT NO. P-13

Ford Motor Company

APPROVED BY | SERIAL | No. 184099 | 184099 | ACCOUNT NO. 270 | DEPT. CHARGE 410 | FACTORY WORK ORDER NO. E66495

ASSIGNED | THESE SPACES TO BE USED FOR ORDERING CASTINGS | NO. WANTED | KIND OF METAL | PATTERN NO. | DELIVER TO

NO. WANTED | Σ OR S NUMBER | DETAIL | PATTERN | FORGING | S. P.

N316 — Disconnect Melling Cam Lathe BT 36496 at K-7- 410 Dept motor Bldg + move to Foundry Tool Room.

N309

N711C — Make all necessary repairs to above mach for shaping Cams on R6250 camshafts.

REASON Broken Bracket

11/16/28 DATE | Ashton | 410 | F-6

FORM 3003 SEE OTHER SIDE

PLAINTIFF'S EXHIBIT NO. P-14

Form 464

PERMANENT INVENTORY OF MACHINE TOOLS

SCRAPPED

MANUFACTURERS NUMBER 18Z-3 FACTORY SERIAL NUMBER 19706

DESCRIPTION

Special machine for shaping 8 cams on Cam Shaft T-410 at one time as per B/P 18Z-3 complete, excepting details #365-366 & 367, sheet #92, also except motors.

SPECIAL EQUIPMENT

#Q
3/18/38

ALTERATIONS

THIS MACHINE OVERHAULED AT OUR PLANT 1-18-19

SCRAPPED

SCRAPPED 1-26-22 TWD 1-3-25

PURCHASED FROM Arthur Colton Co.

MANUFACTURED BY Arthur Colton Co.

F. O. B. Our Plant or our Trap Car Pt. of 8th St.

INVOICE DATE PRICE Material at cost. Labor $1.00 per Hr.

DATE RECEIVED 8/19/16 FGT & CTG $4389.13

COST OF BELTING ON MACHINE PROPER

SCRAPPED

FLOOR	BAY	SECTION	DATE	REMARKS
		A2-3 W	8/30/16	D-84387
			10/1/16	7-12-19
				1-29-20
		B 6 13	10/20/16	5-1x4 5-30-20
			6-30-17	5-5-22
				1-18-24
		Z-5-37	11-29-18	21x4 6-5-24

12x4 6-12-24
J-14x4 9-26-24
7x4 11-13-24
14x4 12-20-24
SCRAPPED 1-6-25

PLAINTIFF'S EXHIBIT NO. Q

1471

Form 464

PERMANENT INVENTORY OF MACHINE TOOLS

MANUFACTURERS NUMBER No # FACTORY SERIAL NUMBER 11628 —

DESCRIPTION Special machine for shaping 8 cams on Cam Shaft T-410 at one time as per B/P 18Z-5 complete, excepting details #365-366 & 367, sheet #92, also except motors.

SPECIAL EQUIPMENT

#R
3/18/38

ALTERATIONS THIS MACHINE OVERHAULED AT OUR PLANT 2-11-19

SCRAPPED 2nd 9-16-37 1-8-25

PURCHASED FROM Arthur Colton Co.

MANUFACTURED BY Arthur Colton Co. $4389.13

F. O. B. Our Plant or our Trap Car Ft. of 8th St.

INVOICE DATE PRICE Material at cost. Labor $1.00 per Hr.

DATE RECEIVED 10/20/16 PAY ROLL

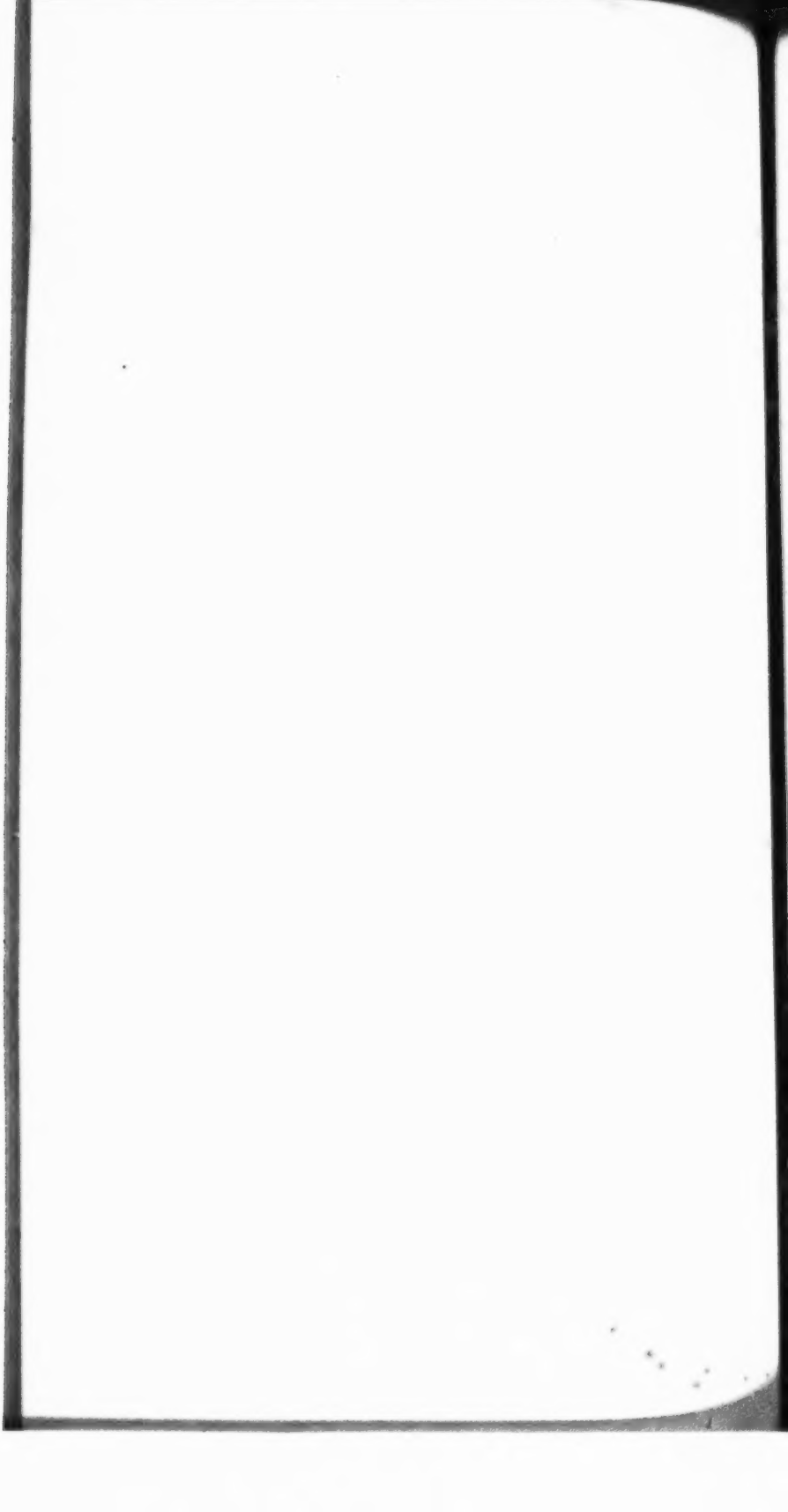
COST OF DELIVERY OR MACHINE PROPER

FLOOR	BAY	SECTION	DATE	REMARKS
		M.T.R.	10/23/16	B8x4 D-54567 1-30-19 #21X4 6-5-24
		B8x3	12-26-16	7-12-19 1-29-20 #13X4 6-12-24
			10-8-17	B-7x4 - 8-30-20 10-6-20 #14X4 8-19-24
			B-10-18	1-8-22 To be salvaged 1-18-24 1-6-25
		Z-5-37 Oct 33	11-13-17 1-15-17	SCRAPPED

PLAINTIFF'S EXHIBIT NO. R

1472

COPY BOUND VERTICALLY



Form 404

PERMANENT INVENTORY OF MACHINE TOOLS

MANUFACTURERS NUMBER 18Z-3

FACTORY SERIAL NUMBER 12205

DESCRIPTION

Special machine for shaping 8 cams on Cam Shaft T-410 at one time as per B/P 18Z-8 complete, excepting details #565-566 & 567, sheet #92, also except motors.

SPECIAL EQUIPMENT

5

WORK ORDER ISSUED TO MAKE MOTOR DRIVE #1301-16 Date 1-3-25

HP 7½ 1150 RPM

OVERHAULED IN OUR PLANT 6/21/20.

ALTERATIONS

SOLD TO Wardwell Sheet Metal Co. Detroit, Mich.

SHIPPED TO Same

INV. NO P-618 DATE 8-24-26

SALE PRICE $1,250.00 NET TON

DISPOSITION Sent as Scrap

PURCHASED FROM Arthur Colton Co.

MANUFACTURED BY Arthur Colton Co.

F. O. B. Our Plant on our Trap Car Ft. of 8th St.

INVOICE DATE

PRICE Material at cost. Labor $1.00 per Hr.

DATE RECEIVED 12/1/16

POTENTS

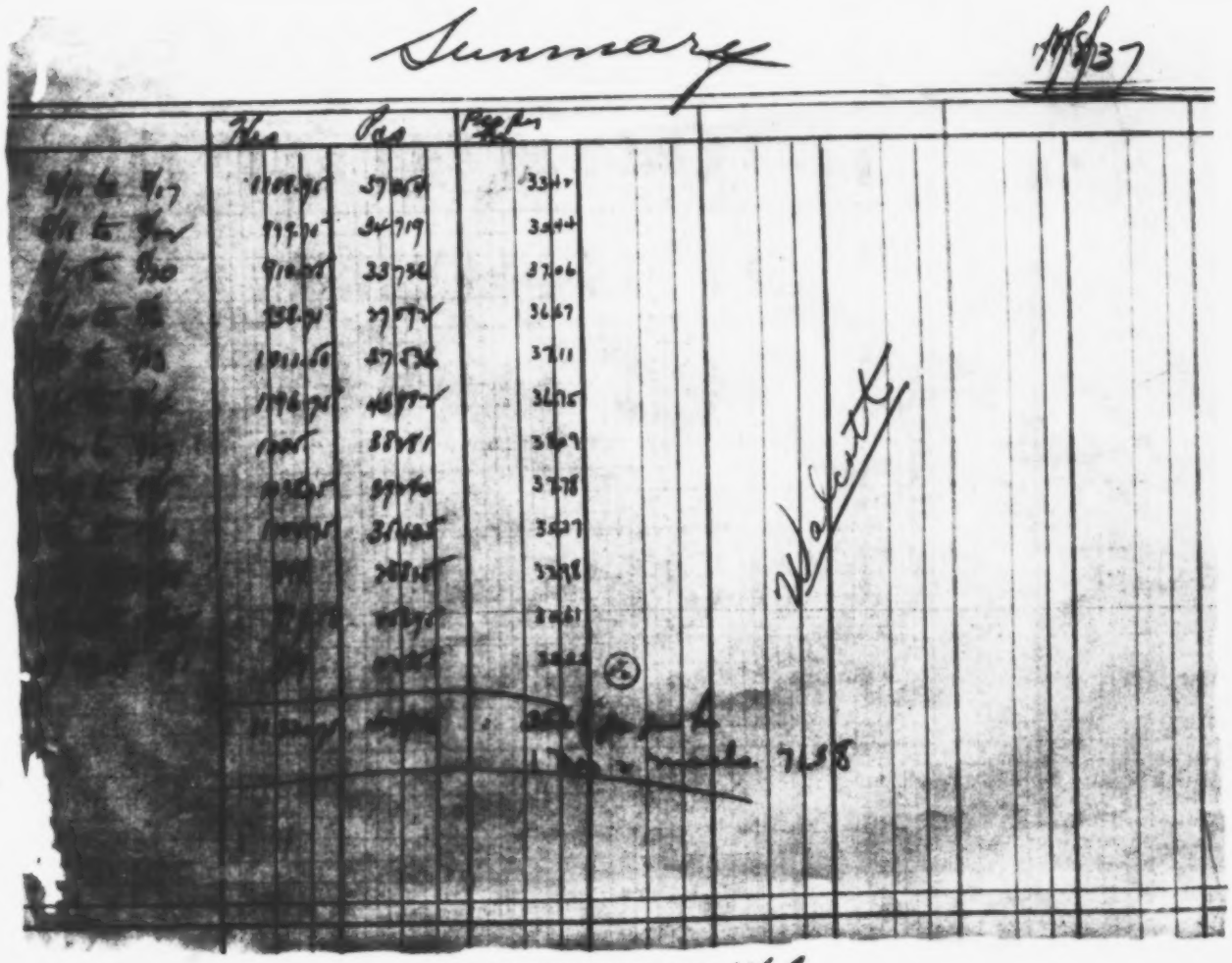
COST OF BELTING ON MACHINE PROPER

FLOOR	BAY	SECTION	DATE	REMARKS	
		A2-36	12-11-16	D-54567	J 1X4 2-23-24
		95-13	11-20-18	B-7X4 - 1-12-24	Range 12-30-24
		B 8X4	7-12-19 1-20-20	J 13-4 6-5-24	
			8-3-20	8-19-24	
		H.7X4	8-30-20	9-26-24	
			9-5-21	B 7X4 11-12-24	

PLAINTIFF'S EXHIBIT NO. 5

1473

COPY BOUND VERTICALLY



PLAINTIFF'S EXHIBIT NO. W-1

1474

COPY BOUND VERTICALLY

Mr A N Wibel

8-18-24

REPORT ON MILLING GAS ENGINE - WEEK OF AUGUST 11TH TO 17TH 1924

B. T. No.	No. Pieces	Hrs Run	Hours Lost Due to Mch Trouble	No Tools	No Stock	No Oper.	REMARKS
35472	0	0	120.				Setting up Machine
36386	3171	88.75	3.50		19.50	7.25	
36451	3035	84.50	16.75		11.50	7.25	
36496	2874	77.			41.	2.	
36552	2545	69.25	12.25		36.50	2.	
36592	2019	54.75	5.		52.	8.25	
36948	2096	56.75	15.	18.	29.	5.25	
36928	1300	35.	85.				Broken Tool Holder
37501	3721	103.75	5.		1.50	11.75	
37687	578	16	8		87.	9.	
37732	3425	99.75	11.		7.	2.25	
37754	305	7.75	76.25		24.	12.	Broken Tool Holder
37844	2132	62.50	8.		49.	.50	
37867	3502	96.50	11.		7.50	4.	
38005	3751	94.	3.50		18.50	4.	
38080	2500	66.	44.		10.		
Total	37,054	1108.75	422.25	18.	394.	65.50	
		5[illegible]	21.	.89	19.6	3.3	

Payne

PLAINTIFF'S EXHIBIT NO. W-2

Mr A M Wibel Engineering 8-25-24

REPORT ON MILLING [illegible] CHAFERS - WEEK OF AUGUST 19TH TO [illegible] 1924

PT No.	No. Pieces	Hrs. Run	Mch Trouble	Hours Lost Due to Tool Trbl	No Tools	No Stock	No Oper.	REMARKS
35473		0	120.					Setting up Machine
36286	640	16.75	99.25				4.	Tail Stock Trouble
36451	745	22.25	61.75			8.		Cam & Tool Holder - out of order
36496	3841	107.	2.			11.		
36552	4039	111.				9.		
36592	2213	65.				19.	28	
36948	1888	56.50	19.	3.	3.	27.50	11.	
36928	0	0	120.					Slide out of order
37501	2458	67.	44.			3.	6.	Tool Holder out of order
37557	3874	103.	16.				1.	Master Cam worn out
37732	3777	77.	30.			11.	12.	
37734	3807	102.50		.50		8.	9.	
37844	3396	70.50				34.	15.50	
37867	715	20-1/2	97.50				2	Repair Slides
38005	3720	83.50	22.			12.50	2	
38060	3601	77.25	29.75			9.	4	
Total	34,719	979.75	671.25	3.50	3.	188.	94.50	
		51.%	35.%			8.%	5.%	

Payne

PLAINTIFF'S EXHIBIT NO. W-3

Mr A M Wibel — Engineering — 9-11-34

REPORT ON SELLING CAM SHAPERS - WEEK OF AUGUST 26TH TO SEPT. 1934

MI No.	No. Pieces	Hrs. Run	Mch Trouble	Tool Trouble	No Tools	No Stock	No Oper.	REMARKS
35472	0	0.	112.					Setting Up
36286	2885	79.	29.	1.		2.	1.	Rep Tail Stock
36451	2970	82.	26.50			2.50	1.	" " " & Slide
36496	4155	111.					1.	
36582	2975	78.50	32.	.50			1.	Broken Drive Gear
36892	1650	37.25	64.25				10.50	Rep Tool Holder
36948	1333	36.25	61.25	14.50			8.	Rep Slide & change cam
36928	0	0.	112.					Rep. Slide & Tail Stock
37501	1210	32.50	70.50			9.		Rep. Slide, Cam & Drive Gear
37657	0	0.	112.					Rep. Slide & Tail Stock
37732	844	15.75	75.25		5.		16.	Overhauling Slides
37754	1230	31.	81.					" "
37844	3777	104.	.50	1.			5.50	
37867	3615	98.	12.			1.	1.	
38005	4012	108.				2.	2.	
38080	3500	97.	7.50				7.50	
Total	33,736	910.25	795.75	17.	5.	16.50	54.50	
%		51%	44%	1%		1%	3%	

A — H E PAYNE — ENGINEERING

PLAINTIFF'S EXHIBIT NO. W-9

Payne - Want to recap all reports to date. How eff. in 24

Mr A M Wibel — Engineering — 9-11-24

REPORT ON MILLING C.H SHAPERS - WEEK OF SEPT. 2ND TO 6TH 1924

BT No.	No. Pieces	Hrs. Run	Mch Trouble	Tool Trouble	No Tools	No Stock	No Oper.	REMARKS
35472	0	0.	96.					Setting Up
36386	3450	93.50	.50	1.			1.	
36451	3385	93.	2.				1.	
36496	1965	53.50	30.				12.50	Rep Bushing
36552	75	2.	94.					Rep Tool Holder
36592	1200	33.	39.				24.	" Master Cam & Clutch
36848	565	14.50	48.50		6.	3.	16.	Tools out of line
36928	685	19.	76.				1.	Tool Holder out of order
37501	580	17.50	76.50				2.	Rep Drive Gear
37657	2320	68.	26.				2.	
37732	1460	41.50	11.50	4.	23.		16.	Overhauling slides
37754	1786	48.50	46.50					
37844	2770	76.	9.				11.	
37867	1380	37.75	58.25					Overhauling slides
38005	2999	82.50	.50				13.	
38080	2452	58.50	25.50				5.	Tool Holder & Tail Stock Trouble
Total	27,092	738.75	639.75	5.	29.	3.	104.50	
%		49%	42%		2%		7%	

A — H E PAYNE — ENGINEERING

PLAINTIFF'S EXHIBIT NO. W-5

Mr A M Wibel — Engineering — 9-16-24

REPORT ON MILLING CAM HEATERS - WEEK OF SEPT 9TH TO 13TH 1924

BT No.	No. Pieces	Hrs. Run	Mch. Trouble	Hours Lost Due to Tool Trouble	No Tools	No Stock	No Oper.	REMARKS
36472			128.					Not assembled
36386	2861	74.25	39.25			5.50	5.	Cam out of line
36451	3829	106.	.50			5.50	16.	
36490	1600	44.50	83.	.50				Slides & Tool Holder Out of order
36552	2712	73.50	39.				15.50	Setting up & Broken Key
36592	715	19.	77.				32.	Tool Holder out of order
36848	2330	61.50			39.		27.50	
36928			106.				22.	Tool Holder out of order
37501	2785	75.25	16.75			.50	35.50	Clutch out of order
37657	3643	97.75	14.25	1.			15.	Tail Stk out of order
37732	208	5.50	19.		64.		39.50	Master Cam Trouble
37754	3843	103.75	12.50	.50		.50	10.75	Tail Stock Trouble
37844	2627	71.	35.50			.50	21.	Tool Holder out of order
37867	1945	52.50	59.				16.50	Overhauling Slides
38005	4295	115.50		.50		1.	11.	
38080	4143	111.50	.50	.50			15.50	
Total	37,536	1011.50	650.25	3.	103.	13.50	282.75	
%		49.45	30.90	.14	5.03	.66	13.82	

A — H E PAYNE ENGINEERING

PLAINTIFF'S EXHIBIT NO. W-6

Mr A M Wibel — Engineering — 9-26-24

CAM SHAPER REPORT - WEEK OF SEPT 15th TO 24th, 1924

Pt No.	Pieces Made	Hours Run	Mach Trbl	Not Assem.	Tool Trbl	No Tools	No Stock	No Oper.	REMARKS
36472				144					
36386	1297	34.	52.50				35.50	21.	Cam Trouble
36451	1040	37.50	72.				6.	37.50	Steady Rest and Tail Stock Trouble
36496	2960	82.50	27.50				8.	29.	Tool Holder out of order
36552	1920	52.25	65.					28.75	Rep. Feed Gear
36892	4675	125.	7.					12.	Tool Holder Trouble
36848	3800	105.50	.50			6.		34.	
36926	3728	100.	19.					29.	Clutch out of order
37501	1975	53.25	25.					65.75	Cam worn out
37732			24.			16.		104.	Out of Time
37734	5076	141.50	1.		1.			.50	
37844	1719	45.75	69.50					22.75	Rep. Tail Stock
37857	1685	45.	41.				10.	48.	Drive Chain Broke
38005	4401	121.						22.	
38080	4407	122.50	4.		.50		2.	14.50	
37487	5299	143.			.50			.50	
Total	43982	1196.75	406.	144	2.	22.	86.50	476.25	
%									

A — H H PAYNE — ENGINEERING

PLAINTIFF'S EXHIBIT NO. W-7

Mr A N Vibel Engineering [redacted]

[redacted] - week of [redacted]

M No	Pieces Made	Hours Run	Mach Trbl	Ext Assem	Tool Trbl	No Tools	No Stock	No Oper.	REMARKS
28472				128.					
26286			128.						Gun Worn
26451	2248	84.					44.		
26496	4430	114.	13.					1.	
26502	4888	125.75	1.25					1.	
26592	3857	100.50	26.					8.50	New Slides
26648	1796	48.50				29.	19.50	31.	
26926	4489	125.50						1.50	
27501	408	10.50	64.				40.	15.50	Installing New Ends
27657	2253	63.75	9.25				23.	13.	Tool Holder Trouble
27732	1100	28.50	37.50		2.	22.	16.	24.	Pin out of Feed Gear
27734	1105	29.	99.						
27846	3890	102.50	.50				16.	9.	
27867	4043	106.50					13.	8.50	
28008	1680	38.	72.				13.	5.	Installing New Ends
28080	280	10.	114.50				3.50		
Total	38281	1005.	868.	128.	2.	51.	198.	110.50	
%									

PLAINTIFF'S EXHIBIT NO. W-8

Mr A H Wibel Engineering 18-10-24

GAS HEATER REPORT - WEEK OF SEPT 29TH TO OCT 5TH 1924

MT No	Pieces Made	Hours Run	Mach Trbl	Not Assem	Tool Trbl	No Tools	No Stock	No Oper.	REMARKS
26472				128.					
26296			128.						Gas Trouble
24451	2945	89.50	8.				35.50		
24456	3400	96.50	17.				14.50		Tool Holder Trouble
24522	2915	102.	4.50				20.50		
24592	4160	108.	18.		1.		4.		General Trouble
24648	1758	46.50				8.	35.	38.50	
24686	4208	111.	12.50		.50		4.		Tool Holder Trouble
27501	2465	90.50	89.50					8.	Broken Chain
27497	4048	104.75	2.75				16.	2.50	
27752	280	12.75	84.		8.	8.75	8.	6.	Overhauling Heads
27701	2378	84.75	41.25		1.			1.	Feed Gear Broken
27704	2965	91.50	38.50					1.	General Trouble
27697	2915	90.	17.				16.	5.	" "
28005	85	2.	116.				8.		Installing New Heads
28020			128.						Rep. Tool Holder
Total	28840	1068.75	686.	128.	8.50	16.75	181.50	62.	

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A H B PAYNE ENGINEERING

PLAINTIFF'S EXHIBIT NO. W-9

Mr A M Wibel Engineering 10-16-24

CAM SHAPER REPORT - WEEK OF OCTOBER 6TH TO 11TH 1924

Pf NO	Pieces Made	Hours Run	Mach Trbl	Not Assem	Tool Trbl	No Tools	No Stock	No Oper	REMARKS
35672				128.					
36386	1855	56.	27.			13.	32.		Head stock out of order, Clutch Trouble
36451	555	16.	104.					8.	Overhauling 8 heads
36496	4045	114.	9.				5.		
36552	3850	110.75	2.		2.	4.		9.25	
36592	3965	112.	7.				9.		
36848	3385	92.50	33.50		1.		1.		General Trouble
36928	4400	121.					7.		
37501	185	5.	107.					8.	Repairing Heads
37657	3460	100.	11.50				12.50	4.	Broken Tool Holder
37732	755	21.	96.		1.		10.		Preparing for shipment to Rouge
37754	360	11.	108.				1.	16.	Ditto
37844	2755	73.	29.				18.		General Trouble
37867	2785	75.50	14.50				18.	20.	Moving to Rouge
38005			128.						N-160 Gen Overhauling
38080	3080	89.	32.				7.		Slide out of order
Total	35435	1004.75	708.50	128.	4.	17.	120.50	65.24	

$

A H E PAYNE ENGINEERING

PLAINTIFF'S EXHIBIT NO. W-10

Mr A M Wibel Engineering 10-27-24

CAM SHAPER REPORT - WEEK OF OCTOBER 13TH TO 18TH

BT NO	Pieces Made	Hours Run	Mach Trbl	Not Assem	Tool Trbl	No Tools	No Stock	No Oper.	REMARKS
35472	1530	46.50	6.50	62.		1.	9.	3.	Shipped to River Rouge
36386	3105	96.	10.		3.	5.	3.	4.	
36451	765	20.50					.50	3.	
36496	3905	111.	10.				2.50		
36552	4295	122.	3.50				2.50		
36592	2240	63.50	56.					9.50	Clutch Trouble
36928	3180	94.	32.				.50	1.50	Slide out of order
37657	3630	114.50	.50			1.	8.50	3.50	Broken Tool Holder
37844	2510	72.50	27.				8.50	9.	
38005	1070	28.50					.50	3.	Shipped to River Rouge
38080	2585	79.	18.		2.	10.	4.	7.	Clutch Trouble
Total	28815	848.	163.50	62.	5.	17.	39.50	43.50	

H E PAYNE ENGINEERING

PLAINTIFF'S EXHIBIT NO. W-11

Mr A M Wibel Engineering 11-8-24

REPORT ON MILLING CAM SHAPERS - WEEK OF OCTOBER 20TH TO 25TH

ST No.	No. Pieces	Hrs. Run	Hours Lost Due To Mch. Trouble	Tool Trouble	No Tools	No Stock	No Oper.	REMARKS
35472	3605	103.50	16.		7.50			Clutch Trouble
36496	4220	123.50	1.50				3.	
36552	4165	121.	4.				3.	
36892	3930	111.50	13.	2.50			1.	Clutch Trouble
36848	440	14.		6.	41.		3.	Motor Disconnected
36928	3800	99.	28.				1.	Installing New Slides
37657	4035	215.50	6.50				5.	
37844	1800	51.50	2.50	1.		1.		Going to River Rouge
38080	----				54.		2.	" " "
Total	25695	839.50	71.50	9.50	102.50	1.	18.	

A H PAYNE ENGINEERING

PLAINTIFF'S EXHIBIT NO. W-12

Mr A M Wibel Engineering 9-16-24

REPORT ON MILLING CAM SHAPERS - WEEK OF OCTOBER 27TH TO NOV 1ST.

ST No.	No. Pieces	Hrs. Run	Mch. Trouble	Hours Lost Due to Tool Trouble	No Tools	No Stock	No Oper.	REMARKS
35472	4160	125.	16.50		.50	4.	[illegible]	Repair Chain
36496	4125	120.	18.50			5.50	[illegible]	Cam Trouble
36552	4435	120.	6.			5.50	6.50	Slide Trouble
36592	2895	84.50	30.			11.	10.50	
36848	----			112.				Motor Disconnected
36928	2735	77.	35.					Slides & Tail Stock out of order
37657	4505	124.50	9.50			4.	6.	New Master
Total	22955	649.	115.50	112.	.50	30.	23.	

A N PAYNE ENGINEERING

PLAINTIFF'S EXHIBIT NO. W-13

Mr A M Wibel — Engineering — 9-19-34

RECAP OF MILLING GAS SHAPERS on T-410.

E.T.	No of Pieces	Hours Run	Mch Trouble	Tool Trouble	No Tools	No Stock	No Oper.
36478	0	0	576.	0	0	0	0
36586	18012	362.25	171.50	2.	0	27.	16.25
36651	13964	287.75	127.50	0	0	27.50	25.25
36686	14415	993.	114.	.50	0	52.	15.50
36652	12446	253.25	177.25	.50	0	45.50	16.50
36692	7797	267.	185.25	0	0	71.	102.75
36648	8212	225.50	141.75	17.50	64.	59.50	65.75
36928	1965	54.	499.	0	0	0	23.
37501	10754	296.	212.75	0	0	14.	55.25
37657	10415	284.75	176.25	1.	0	27.	27.
37732	8484	239.50	136.75	0	22.	18.	85.75
37754	10973	291.50	216.25	1.	0	32.50	31.75
37844	12702	384.	53.	1.	0	83.50	82.50
37867	11057	305.25	237.75	0	0	8.50	27.
38005	17777	483.50	25.	0	0	32.	32.
38080	15196	410.50	107.25	0	0	19.	32.
Total	170139	4662.75	3158.25	23.50	158.	577.	612.25
%		50.7	34.3	.3	1.7	6.3	6.7

about 6 to 1

4662 / 1139 / 5800 Est. — 3200 H E PAYR — 5800 / 3200 / 4 ENGINEERING — 577 / 612 / 1139

A

PLAINTIFF'S EXHIBIT NO. W-14

EXHIBIT X1.

FORD MOTOR COMPANY
PRODUCTIVE LABOR AND OVERHEAD
FOR DEPARTMENT T 410

For the period from June 1, 1925 to February 28, 1931.

Months	Productive Labor	Overhead
June to December, inclusive, 1925	*	*
January, 1926	$ 62,909.88	$ 84,008.13
February	59,306.94	68,945.28
March	69,146.55	84,292.23
April	*	*
May	*	*
June	48,696.46	69,397.49
July to October, inclusive	*	*
November	65,574.68	97,369.91
December	*	*
January, 1927	58,283.20	82,996.62
February	53,310.77	77,531.01
March	68,320.05	92,290.50
April	54,351.92	85,119.67
May	249,710.42	358,460.04
June, 1927 to February, 1928, inclusive	*	*
March, 1928	383,979.89	447,558.00
April	426,026.67	475,148.94
May	161,354.00	156,416.84
June	165,423.64	171,631.19
July	165,843.40	167,469.92
August	184,494.69	168,764.90
September	160,847.08	159,116.76
October	190,366.59	195,530.67
November	180,039.79	195,001.14
December	*	*
January, 1929	215,922.85	202,037.18
February	193,657.89	197,642.17
March	196,301.27	200,855.86
April	175,020.71	190,257.42
May	190,031.69	195,126.59
June	180,264.14	203,087.58
July	193,567.51	220,448.28
August	200,442.07	224,977.43
September	153,922.47	195,200.30
October	169,232.65	219,447.29
November	103,309.90	163,800.36
December	64,214.22	139,747.94

* Not available.

EXHIBIT X2.

FORD MOTOR COMPANY
PRODUCTIVE LABOR AND OVERHEAD
FOR DEPARTMENT T 410

For the period from June 1, 1925 to February 28, 1931.

(Continued)

Months	Productive Labor	Overhead
January, 1930	$ 87,939.83	$145,167.10
February	119,236.45	195,618.32
March	149,514.16	216,167.92
April	177,954.06	223,733.42
May	182,309.84	246,599.45
June	176,010.73	241,648.41
July	60,658.66	114,603.09
August	111,339.13	178,899.35
September	103,715.10	171,956.69
October	86,511.32	149,475.42
November	78,540.83	147,837.62
December	58,743.22	135,272.64
January, 1931	59,624.21	120,931.88
February	83,081.80	147,409.48

EXHIBIT X3.

FORD MOTOR COMPANY
PRODUCTIVE LABOR AND OVERHEAD FOR F 446
CAMSHAFT MACHINING

For the period from June 1, 1925 to March 31, 1928.

Months	Productive Labor	Overhead	Overhead Percentages	
Department 105:				
June to December, inclusive, 1925	*	*		
January, 1926	$105,857.33	$178,937.71	169.037	
February	138,974.51	234,512.23	168.745	
March	124,779.76	234,215.80	187.703	(Used 150 pct.)
April	*	*		
May				
June	98,673.30	193,146.33	195.743	
July to October, inclusive	*	*		
November	22,200.11	149,677.33	674.219	
December, 1926 to March, 1928, inclusive	*	*		
Departments 102, 105 and 106 combined:				
June, 1925 to December, 1926, inclusive	*	*		
January, 1927	133,935.24	324,142.77	242.01	
February	236,317.99	373,399.23	158.007	
Departments 102, 105, and 106 combined:				
March, 1927	335,789.35	447,867.90	133.378	
April	*	*		
May	207,504.98	398,269.68	191.933	
June, 1927 to March, 1928, inclusive	*	*		
Department 102:				
June, 1925 to October, 1927, inclusive	*	*		
November	232,425.83	399,546.41	171.903	
December, 1927 to February, 1928, inclusive	*	*		
March	103,137.11	218,493.79	211.85	(Used 176 pct.)

* Not available.

Form 464

Ford Motor Company

PERMANENT INVENTORY OF MACHINE TOOLS

MANUFACTURER'S NUMBER 111

FACTORY SERIAL NUMBER 76592

Melling Cam Turning Lathe, with [illegible] equipment and tooling to turn [illegible] on T-410 Camshaft, guaranteed to [illegible] hour and to be placed in [illegible] to have hand operated chuck. Head [illegible] use. Arranged for chain motor drive [illegible] guard, we to supply motor and [illegible]

Overhauled at C Plant. Dept 440 F.W.D. 66375 Date 4-24

Overhead Control Cams
Req 26372 3-27-28
Order B-59335 4-9-28
$ 240.00

For operating [illegible]

6 HP, 1150 RPM Westinghouse Motor, type [illegible] out pulley, slide [illegible] or starter. [illegible]

Motor	H. P.	Type	Frame	Voltage
B 7 x 4				

Order

LOCATION			
Building	Date	Building	Date
B 7 x 4	4-26-24	Range 11 [illegible]	
		" K 2 Motor Alley	12-20-28
		H. Park AVAIL IPT ROOM	2-5-31
		TRACK 807	2-5-31

Purchased from

Manufactured by

F. O. B. | Req. No. | F'GT & C'TG | WEIGHT

Rec'd 4-19-24 | Order No. | Price

Use

Ho

VE OVE

PLAINTIFF'S EXHIBIT NO. Y-1

1491

W. O. ISSUED	DATE	BY DEPT.	W. O. ISSUED	DATE	BY DEPT.	W. O. ISSUED	DATE	BY DEPT.

SALVAGED By F.M.Co.
F.W.O. 563822 DATE 6-18-31
Disposition Single purpose. Replaced by 182505 Milling Machine

BRASS TAG RET'D BY SALVAGE DEPT.

1492

EXHIBIT Z-3.

SAVINGS EFFECTED BY FORD MOTOR COMPANY THROUGH USE OF MELLING CAM LATHES FOR ROUGH TURNING CAMS OF CAMSHAFTS T-410, A-6250 AND F-446 FROM JUNE 16, 1925 TO DATE USE OF THESE MACHINES WAS ABANDONED.

MINIMUM SAVINGS from June 16, 1925 to February 3, 1931, based upon production shown upon Exhibit D, pages 14, 15 and 16 of this report, per Exhibit A, Page 2 of this report	$895,793.95
ADDITIONAL SAVINGS based upon rejection of claims made by defendant, but not substantiated by records supplied:	
Item one of Exhibit H—Page 21 of this report	32,629.23
Item two of Exhibit H—Page 21 of this report	28,917.18
TOTAL	$957,340.36

PLAINTIFF'S EXHIBIT A.

Cost of Machining or Grinding Cams upon Ford Camshafts with Melling Cam Lathes and with Other Available Equipment, and Minimum Saving by Ford Motor Company through Use of Melling Cam Lathes from June 16, 1925 to February 3, 1931.

Based on Production Per Hour as Shown by Exhibit C, Pages 10 to 13 of this report.

	Production*	Cost per Shaft		Total Cost		Saving through Use of Melling Cam Lathes
		Ford Cam Shapers	Melling Cam Lathes	Ford Cam Shapers	Melling Cam Lathes	
Model T—T-410:						
June 16 to December 31, 1925	1,093,205	$ .031314	$ .020871	$ 34,232.62	$ 22,816.29	$ 11,416.33
1926	1,699,205	.039292	.026189	66,765.17	44,500.48	22,264.69
1927	506,086	.045418	.030272	22,985.41	15,320.24	7,665.17
1928	120,448	.033864	.022570	4,078.85	2,718.51	1,360.34
January 1 to 15, 1929	1,222	.032914	.021937	40.22	26.81	13.41
Totals, T-410	3,420,166			128,102.27	85,382.33	42,719.94
		Landis Grinders	Melling Cam Lathes	Landis Grinders	Melling Cam Lathes	
Model A—A-6250:						
November and December, 1927	9,287	.232398	.033506	2,158.28	311.17	1,847.11
1928	843,456	.180847	.026074	152,536.49	21,992.27	130,544.22
1929	1,961,973	.202608	.029212	397,511.43	57,313.16	340,198.27
1930	1,370,417	.258942	.037334	354,858.52	51,163.15	303,695.37
January 1 to February 3, 1931	37,866	.294745	.042495	11,160.81	1,609.12	9,551.69
Totals, A-6250	4,222,999			918,225.53	132,388.87	785,836.66
		Landis Grinders	Melling Cam Lathes	Landis Grinders	Melling Cam Lathes	
Tractor—F-446:						
June 16, to December 31, 1925	59,973	.278201	.055641	16,684.55	3,336.96	13,347.59
1926	99,111	.317488	.063498	31,466.55	6,293.35	25,173.20
1927	100,705	.309938	.061987	31,212.31	6,242.40	24,969.91
January, February, March, 1928	15,875	.295013	.059003	4,683.33	936.68	3,746.65
Totals, F-446	275,664			84,046.74	16,809.39	67,237.35
GRAND TOTALS—ALL TYPES ...	7,918,829			1,130,374.54	234,580.59	895,793.95

* See Plaintiff's Exhibit D, Pp. 14 to 16 of this report.

Note: See Exhibit B for unit costs of shafts—P. 5 of this report.

PLAINTIFF'S EXHIBIT A-1.

Productive Labor Cost of Machining or Grinding Cams upon Ford Camshafts with Melling Cam Lathes and with Other Available Equipment, and Minimum Labor Saving by Ford Motor Company through Use of Melling Cam Lathes from June 16, 1925 to February 3, 1931.

Based on Production per Hour as Shown by Exhibit C, Pages 10 to 13 of this Report.

	Production*	Productive Labor Cost per Shaft		Total Productive Labor Cost		Productive Labor Savings through Use of Melling Cam Lathes
		Ford Cam Shapers	Melling Cam Lathes	Ford Cam Shapers	Melling Cam Lathes	
Model T—T-410:						
June 16 to December 31, 1925	1,093,205	$ .016286	$ .010855	$ 17,803.94	$ 11,866.74	$ 5,937.20
1926	1,699,205	.016922	.011279	28,753.95	19,165.33	9,588.62
1927	506,086	.018622	.012412	9,424.33	6,281.54	3,142.79
1928	120,448	.016450	.010964	1,981.37	1,320.59	660.78
January 1 to 15, 1929	1,222	.017004	.011333	20.78	13.85	6.93
Totals, T-410	3,420,166			57,984.37	38,648.05	19,336.32
		Landis Grinders	Melling Cam Lathes	Landis Grinders	Melling Cam Lathes	
Model A—A-6250:						
November and December, 1927	9,287	.095286	.013738	884.92	127.58	757.34
1928	843,456	.087852	.012666	74,099.30	10,683.21	63,416.09
1929	1,961,973	.093992	.013552	184,409.77	26,588.66	157,821.11
1930	1,370,417	.101299	.014605	138,821.87	20,014.94	118,806.93
January 1 to February 3, 1931	37,866	.102328	.014753	3,874.75	558.64	3,316.11
Totals, A-6250	4,222,999			402,090.61	57,973.03	344,117.58
		Landis Grinders	Melling Cam Lathes	Landis Grinders	Melling Cam Lathes	
Tractor—F-446:						
June 16 to December 31, 1925	59,973	.102013	.020403	6,118.03	1,223.63	4,894.40
1926	99,111	.105150	.021030	10,421.52	2,084.30	8,337.22
1927	100,705	.114975	.022995	11,578.56	2,315.71	9,262.85
January, February, March, 1928	15,875	.106888	.021378	1,696.85	339.38	1,357.47
Totals—F-446	275,664			29,814.96	5,963.02	23,851.94
GRAND TOTALS, ALL TYPES	7,918,829			489,889.94	102,584.10	387,305.84

* See Plaintiff's Exhibit D, Pp. 14 to 16 of this report.

Note: See Exhibit B for unit costs of shafts—P. 5 of this report.

PLAINTIFF'S EXHIBIT A-2.

Burden Cost of Machining or Grinding Cams upon Ford Camshafts with Melling Cam Lathes and with Other Available Equipment, and Minimum Burden Saving by Ford Motor Company through Use of Melling Cam Lathes from June 16, 1925 to February 3, 1931.

Based on Production per Hour as Shown by Exhibit C—Pages 10 to 13 of this Report.

	Production*	Burden Cost Per Shaft		Total Burden Cost		Burden Saving through Use of Melling Cam Lathes
		Ford Cam Shapers	Melling Cam Lathes	Ford Cam Shapers	Melling Cam Lathes	
Model T—T-410:						
June 16 to December 31, 1925	1,093,205	$ .015028	$ .010016	$ 16,428.68	$ 10,949.55	$ 5,479.13
1926	1,699,205	.022370	.014910	38,011.22	25,335.15	12,676.07
1927	506,086	.026796	.017860	13,561.08	9,038.70	4,522.38
1928	120,448	.017414	.011606	2,097.48	1,397.92	699.56
January 1 to 15, 1929	1,222	.015910	.010604	19.44	12.96	6.48
Totals, T-410	3,420,166			70,117.90	46,734.28	23,383.62
		Landis Grinders	Melling Cam Lathes	Landis Grinders	Melling Cam Lathes	
Model A—A-6250:						
November and December, 1927	9,287	.137112	.019768	1,273.36	183.59	1,089.77
1928	843,456	.092995	.013408	78,437.19	11,309.06	67,128.13
1929	1,961,973	.108616	.015660	213,101.66	30,724.50	182,377.16
1930	1,370,417	.157643	.022729	216,036.65	31,148.21	184,888.44
January 1 to February 3, 1931	37,866	.192417	.027742	7,286.06	1,050.48	6,235.58
Totals, A-6250	4,222,999			516,134.92	74,415.84	441,719.08
		Landis Grinders	Melling Cam Lathes	Landis Grinders	Melling Cam Lathes	
Tractor—F-446:						
June 16 to December 31, 1925	59,973	.176188	.035238	10,566.52	2,113.33	8,453.19
1926	99,111	.212338	.042468	21,045.03	4,209.05	16,835.98
1927	100,705	.194963	.038992	19,633.75	3,926.69	15,707.06
January, February, March, 1928	15,875	.188125	.037625	2,986.48	597.30	2,389.18
Totals, F-446	275,664			54,231.78	10,846.37	43,385.41
GRAND TOTALS, ALL TYPES	7,918,829			640,484.60	131,996.49	508,488.11

* See Plaintiff's Exhibit D,—Pp. 14 to 16, of this report.
Note—See Exhibit B for unit costs of shafts—P. 5 of this report.

COPY BOUND VERTICALLY

(Exhibit Z-3, Page 6)

PLAINTIFF'S EXHIBIT B-1.

DETERMINATION OF BURDEN RATIO TO PRODUCTIVE LABOR.

On June 1, 1938, at cross examination, defendant presented three sheets showing total productive labor and total overhead as follows: Pltfs. Exs. — X-1 — X-2 — X-3 —

For Department 410:

5 Months of 1926
5 " " 1927
9 " " 1928
12 " " 1929
12 " " 1930
3 " " 1931

For Department 105 or for Departments 102, 105 and 106 combined:

5 Months of 1926
5 " " 1927
1 " " 1928

The data thus supplied has been used, as shown below, for periods subsequent to December 31, 1925. For the period beginning June 15, 1925 and ended December 31, 1925, the data has been obtained from cost summary cards furnished by defendant at earlier dates:

Department 410:

Months	Production	Unit Costs: Labor	Unit Costs: Burden	Total Amounts: Labor	Total Amounts: Burden
From Cost Summary Cards:					
June 16 to 30, 1925 (½ of June)	100,575	.3066	.2894	30,836.30	29,106.40
July "	172,650	.2960	.3271	51,104.40	56,473.82
August "	92,700	.3235	.2955	29,988.45	27,392.85
September "	119,500	.3106	.2837	37,116.70	33,902.15
October "	222,950	.3195	.2793	71,232.53	62,269.93
November "	212,950	.3084	.2570	65,673.78	54,728.15
Totals	921,325			285,952.16	263,873.30
Weighted average burden percentage (Used for 1925)					92.27

	Productive Labor	Overhead	Burden Percentage
From Data Supplied June 1, 1938 by Defendant (Exs. X-1, X-2 and X-3):			
January 1926	62,909.88	84,008.13	133.54
February "	59,306.94	68,945.28	116.25
March "	69,146.55	84,292.23	121.90
June "	48,696.46	69,397.49	142.51
November "	65,574.68	97,369.91	148.49
Totals, and average percentage (Used for 1926)	305,634.51	404,013.04	132.19
January 1927	58,283.20	82,996.62	142.40
February "	53,310.77	77,531.01	145.43
March "	68,320.05	92,290.50	135.09
April "	54,351.92	85,119.67	156.61
May "	249,710.42	358,460.04	143.55
Totals, and average percentage (Used for 1927)	483,976.36	696,397.84	143.89

(Exhibit Z-3, Page 7)

PLAINTIFF'S EXHIBIT B-1.

DETERMINATION OF BURDEN RATIO TO PRODUCTIVE LABOR.

Department 410 (continued)

Months		Productive Labor	Overhead	Burden Percentage
March	1928	383,979.89	447,558.00	116.56
April	"	426,026.67	475,148.94	111.53
May	"	161,354.00	156,416.84	96.94
June	"	165,423.64	171,631.19	103.75
July	"	165,843.40	167,469.92	100.98
August	"	184,494.69	168,764.90	91.47
September	"	160,847.08	159,116.76	98.92
October	"	190,366.59	195,530.67	102.71
November	"	180,039.79	195,001.14	108.31
Totals, and average percentage (Used for 1928)		2,018,375.75	2,136,638.36	105.86
January	1929	215,922.85	202,037.18	93.57
February	"	193,657.89	197,642.17	102.06
March	"	196,301.27	200,855.86	102.32
April	"	175,020.71	190,257.42	108.71
May	"	190,031.69	195,126.59	102.68
June	"	180,264.14	203,087.58	112.66
July	"	193,567.51	220,448.28	113.89
August	"	200,442.07	224,977.43	112.24
September	"	153,922.47	195,200.30	126.82
October	"	169,232.65	219,447.29	129.67
November	"	103,309.90	163,800.36	158.55
December	"	64,214.22	139,747.94	217.63
Totals, and average percentage (Used for 1929)		2,035,887.37	2,352,628.40	115.56
January	1930	87,939.83	145,167.10	165.07
February	"	119,236.45	195,618.32	164.06
March	"	149,514.16	216,167.92	144.58
April	"	177,954.06	223,733.42	125.72
May	"	182,309.84	246,599.45	135.26
June	"	176,010.73	241,648.41	137.29
July	"	60,658.66	114,603.09	188.93
August	"	111,339.13	178,899.35	160.68
September	"	103,715.10	171,956.69	165.80
October	"	86,511.32	149,475.42	172.78
November	"	78,540.83	147,837.62	188.23
December	"	58,743.22	135,272.64	230.28
Totals, and average percentage (Used for 1930)		1,392,473.33	2,166,979.43	155.62
January	1931	59,624.21	120,931.88	202.82
February	"	83,081.80	147,409.48	177.43
Totals, and average percentage (Used for 1931)		142,706.01	268,341.36	188.04

(Exhibit Z-3, Page 8)

PLAINTIFF'S EXHIBIT B-1.

DETERMINATION OF BURDEN RATIO TO PRODUCTIVE LABOR.

Department 105, or 102, 105 and 106 combined:

	Production	Unit Costs		Total Amounts	
		Labor	Burden	Labor	Burden
From Cost Summary Cards:					
June 16 to 30, 1925 (½ of June)	5,242	.8006	1.2520	4,196.74	6,562.99
July "	9,681	.8140	1.4303	7,880.33	13,846.74
August "	9,245	.7525	1.2479	6,956.86	11,536.84
September "	8,745	.7356	1.2410	6,432.82	10,852.55
October "	9,363	.7486	1.2642	7,009.14	11,836.71
November "	8,825	.6757	1.3316	5,963.05	11,751.37
Totals	51,101			38,438.94	66,387.20
Weighted average burden percentage (Used for 1925)					172.71

	Productive Labor	Overhead	Burden Percentage
From data supplied June 1, 1938 by defendant (Exs. X-1, X-2 and X-3):			
January 1926	105,857.33	178,937.71	169.04
February "	138,974.51	234,512.23	168.74
March "	124,779.76	234,215.80	187.70
June "	98,673.30	193,146.33	195.74
November "	22,200.11	149,677.33	674.22
Totals, and average percentage (Used for 1926)	490,485.01	990,489.40	201.94
January 1927	133,935.24	324,142.77	242.01
February "	236,317.99	373,399.23	158.01
March "	335,789.35	447,867.90	133.38
May "	207,504.98	398,269.68	191.93
November "	232,425.83	399,546.41	171.90
Totals, and average percentage (Used for 1927)	1,145,973.39	1,943,225.99	169.57
March 1928	103,137.11	218,493.79	211.85
Not used. Instead have accepted the suggested percentage			176.00

PLAINTIFF'S EXHIBIT C.

Production Per Hour by Various Types of Machines of Each Type of Camshaft, as Used in this Report.

T-410 Shaft.

By Cam Shaper: 25 per machine hour, 50 per man hour.

Based on production admitted by defendant's witnesses (pp. 205, 212, 222 of Printed Record of Appeal). Same production per hour as used by defendant in its accounting.

By Melling Cam Lathe: —37½ per machine hour, 75 per man hour.

Based on production admitted by defendant's witnesses (pp. 212-223 of Printed Record of Appeal). Supported by operation sheet of 10-8-24. Made at Highland Park. (Defendant's Exhibit 14). Modified by testimony of Mr. Schmidt, who was in charge of maintenance of Department 410 at Highland Park and Rouge. On page 1016 of the typewritten record of the hearing beginning January 16, 1939, Schmidt testified that the Melling lathes came in March, 1924; that slides were changed from cast iron to steel and that many other changes were made in the machines; that it was five or six months after the machines were received before they started to get anywhere near the production they ought to get; that after they made changes in the machines the production kept increasing and that this increase continued after the lathes were moved to the Rouge plant.

This operation sheet showed .86 of a minute for turning the cams, which is equivalent to about 35 per hour. The increase from 35 per hour to 37½ per hour, supported as it is by Mr. Wibel's sheet (Exhibit 247) is, we believe, exceedingly conservative.

A-6250 Shaft.

By Landis Grinders: —9.4297 per machine and man hour.

Calculated upon page 13 of this report. In this calculation, non-grinding time within the operation cycle is obtained from the White Motor Company's motion time study (Plaintiff's Exhibit A a). Unloading and loading time, as shown by this time study, has been eliminated from the non-grinding time because of the use of conveyors by defendant and consequent probable faster handling. Only the non-grinding time necessary because cams were ground one at a time, is retained. The remaining, or actual grinding time, is calculated upon the basis of the relative periphery of the cams upon A-6250 and F-446 shafts. Defendant's Exhibit 12 showed a production of eight F-446 shafts per hour and this production is the basis used for the calculation of the actual grinding time.

By Melling Cam Lathe: 32.711 Per Mach. Hour. 65.422 per Man Hour.

No time study covering the turning of the cams upon this shaft on the Melling lathes during the infringing period, is available, excepting Defendant's Exhibit 16, made at the very beginning of the production of the A-6250 shaft, and disregarded, for this reason, in defendant's accounting. A different type of operation sheet (Exhibit 214) prepared for Autostroy, has been presented by defendant, but this is clearly not an exact copy of a time study, because the production thereon is shown in even numbers per hour. At best, it is an approximation and time study speed showing anything between 30 and 35 per hour were probably changed to the nearest "safe" figure,—in this case 30. This sheet was prepared for use in Russia under the supervision of an employee of defendant, and presumably to indicate production which might be attained by workmen of a nation relatively inexperienced in mechanical operations or mass production. It would naturally state expected production conservatively. It cannot, therefore, be accepted as definitely and accurately proving production of defendant.

In the absence of an actual record, production has been calculated (See Page 13 of this report). In view of the evidence presented at the hearing beginning January 16, 1939, the use of non-turning time within an operation, as shown by the White Motor Company's time study of the Melling lathe, has been eliminated,—this because loading and unloading time has been shown by evidence at the hearing beginning January 16, 1939 to be materially less at the defendant's plant than at the White Motor Company's plant, and, unlike the grinding operation, in which each cam is separately ground, the non-turning time, other than loading and unloading, amounts to so little as to be a negligible factor in the determination of production per hour.

Evidence at the hearing beginning January 16, 1939 shows that the shaft revolution on Melling lathes is based upon motor revolutions per minute and on gearing which cannot be changed by operators and which was not changed. Therefore, theoretically, the production per hour of A-6250 shafts should be the same as that of T-410 shafts. However, evidence at this hearing indicated that even with shunt wound motors a heavier and longer cut would slightly reduce the motor speed. As the periphery of the A-6250 cams is greater than that of the T-410 cams and as the former are produced from 40 carbon steel as compared with 35 carbon steel for the latter, the production of the A-6250 shafts would have been slightly lower than the production of the T-410 shafts.

In recognition of this fact, production of the A-6250 shaft has been reduced from that of the T-410 shaft (37.5 per hour) in proportion to the relative area of the cams upon the two shafts. The reduction in speed, so determined, should be ample to give effect to the slight reduction in motor speed and to the slightly harder steel.

F-446 Shaft.

By Landis Grinders: Based on production of 8 shafts per machine and man hour, from Defendant's Exhibit 12.

By Melling Cam Lathes: 20 Per Machine and Man Hour.

Mr. Herklotz testified (page 256 of printed record of appeal) that production was 25 per machine hour, 50 per man hour. However, Mr. Worley (page 1872 of the typewritten record of the hearing beginning January 16, 1939) stated that the recollection of various men in the plant of the production of these cams, ranged all the way from 15 to 20 per Hour and some even said 25. A calculation based on 37.5 per hour of the T-410 shafts and recognizing the greater area of the F-446 shaft, shows 20.2389 per hour. (37.5 divided by 1.85287) for the F-446 shaft.

Defendant's Exhibit 215, an operation sheet prepared from an English time study, is not conclusive for the reason that there is no information as to the motor speed, or as to the handling methods in the English plant, and for the further reason that it is generally recognized that English workmen's output is much lower than that of American workmen. Also, English production of motor cars and tractors has not been in sufficient quantities to necessitate the mass production methods used in the United States.

In view of the above, it is believed that 20 per machine hour is the most reasonable estimate of production obtainable for the F-446 shaft.

(Exhibit Z-3, Page 14)

PLAINTIFF'S EXHIBIT D.

Production of Camshafts.

For the Period from June 16, 1925 to February 3, 1931.

Month		Model T T-410	Model A A-6250	Tractor F-446
June 16 to 30,	1925	100,575 a		5,242 a*
July	"	172,650 a		9,681 a*
August	"	92,700 a		9,245 a*
September	"	119,500 a		8,745 a*
October	"	222,950 a		9,363 a*
November	"	212,950 a		8,825 a*
December	"	171,880 b		8,872 b
Totals, June 16 to Dec. 31, 1925		1,093,205		59,973
January	1926	157,400 a		11,995 a*
February	"	154,000 a		12,195 a*
March	"	178,200 a		15,092 a*
April	"	170,375 b		10,124 b
May	"	155,139 b		8,823 b
June	"	149,069 b		9,645 a*
July	"	141,877 b		6,554 b
August	"	151,676 b		6,766 b
September	"	141,814 b		6,552 b
October	"	145,830 b		4,914 b
November	"	110,418 a		4,830 a*
December	"	43,407 b		1,621 b
Totals,	1926	1,699,205		99,111
January	1927	83,909 b		4,636 b
February	"	68,810 b		7,932 b
March	"	93,781 b		13,510 a*
April	"	80,555 b		9,704 b
May	"	83,520 b		6,944 b
June	"	13,109 b		7,398 b
July	"	12,711 b		6,531 b
August	"	14,837 b		9,977 b
September	"	18,703 b		9,737 b
October	"	16,625 b		9,606 b
November	"	12,285 c	2,553 c	10,380 c
December	"	7,241 c	6,734 c	5,250 c
Totals,	1927	506,086	9,287	100,705
January	1928	9,191 c	13,509 c	7,795 c
February	"	7,844 c	19,512 c	5,360 c
March	"	8,041 d	32,295 d	2,720 a*
April	"	8,435 c	44,503 c	
May	"	12,508 c	55,306 c	
June	"	14,878 c	67,866 c	
July	"	13,712 c	69,537 c	
August	"	13,491 c	96,098 c	
September	"	11,760 c	89,353 c	
October	"	9,445 c	117,348 c	
November	"	5,444 c	118,145 c	
December	"	5,699 c	119,984 c	
Totals,	1928	120,448	843,456	15,875

PLAINTIFF'S EXHIBIT D.

Production of Camshafts.

For the Period from June 16, 1925 to February 3, 1931.

Month		Model T T-410	Model A A-6250	Tractor F-446
January	1929	1,222 (e)	165,184 (e)	
February	"		160,960 (e)	
March	"		175,960 (e)	
April	"		180,249 (e)	
May	"		194,724 (e)	
June	"		186,277 (e)	
July	"		198,713 (e)	
August	"		198,044 (e)	
September	"		154,561 (e)	
October	"		174,545 (e)	
November	"		109,155 (e)	
December	"		63,601 (e)	
Totals,	1929	1,222	1,961,973	
January	1930		90,529 (e)	
February	"		114,714 (e)	
March	"		156,386 (e)	
April	"		192,275 (e)	
May	"		186,961 (e)	
June	"		169,489 (e)	
July	"		56,702 (e)	
August	"		103,200 (e)	
September	"		94,616 (e)	
October	"		79,907 (e)	
November	"		73,022 (e)	
December	"		52,616 (e)	
Totals,	1930		1,370,417	
January,	1931		32,700 (e)	
February	"		5,166 (e)	
Totals	1931		37,866	
Grand Totals	.....	3,420,166	4,222,999	275,664

a. Quantities obtained from cost summary cards, Form 3566.

b. Quantities arrived at by adding motors produced and camshaft service sales.

c. Quantities obtained from minute cost summaries, Form 2202B.

d. Quantities obtained from Productive Labor Reports, Form 3567.

e. Quantities obtained from minute cost summaries, Form 2202B and prorated between camshafts produced on Melling cam lathes and Ford Cam mills.

Note: All of the above quantities and notes (excepting for those marked "a") are taken from Defendant's Exhibit No. 4 Amended. Those marked "a*" are taken from cost summary cards discovered and supplied subsequent to preparation of Defendant's amended accounting and have been accepted in Defendant's accounting presented at hearing beginning January 16, 1939. These corrections, covering 13 months, considerably increase the production shown by Defendant for each month corrected, the total additions totaling more than 21 percent of the production previously reported for the months corrected.

Quantities obtained by method "b" do not recognize variations in inventories and are therefore estimates.

Quantities obtained by method "c" are likewise estimates, being the balance of production after assigning to Pioch machines production obtained by multiplying *total* hours operated by hourly production of these machines as shown by a time study dated July 1 of the following year.

No separate record was kept, or at least none was presented, of the respective production by Melling and Pioch machines during the period when both types were available.

PLAINTIFF'S EXHIBIT E.

Tabulation of Cost Summary Cards.

Cost Summary Cards			Production	Cost per Camshaft		
				Labor	Burden	Total
T-410:						
January	1923	Ex. F	146,400	.3269	.3171	.6440
February	"	" "	158,100	.3014	.2924	.5938
March	"	" "	184,100	.2902	.2467	.5369
April	"	" "	178,450	.2997	.2398	.5395
May	"	" "	188,150	.3023	.2267	.5290
June	"	" "	185,000	.3162	.2055	.5217
July	"	" F-1	180,750	.3135	.2195	.5330
August	"	" "	191,450	.3220	.2737	.5957
September	"	" "	168,900	.3485	.3137	.6622
October	"	" "	193,500	.3393	.3393	.6786
November	"	" "	180,900	.3280	.3280	.6560
January	1924	" F-2	226,850	.3299	.3299	.6598
February	"	" "	216,450	.3201	.3201	.6402
March	"	" "	218,250	.3180	.3085	.6265
April	"	" "	208,050	.3330	.3230	.6560
May	"	" "	176,800	.3337	.3237	.6574
June	"	" "	142,700	.3239	.3239	.6478
July	"	" F-3	142,450	.3163	.3479	.6642
August	"	" "	148,900	.3088	.3551	.6639
September	"	" "	155,050	.2974	.3331	.6305
October	"	" "	152,950	.3295	.3625	.6920
November	"	" "	107,050	.3300	.3630	.6930
April	1925	" F-4	197,000	.3002	.3302	.6304
May	"	" "	187,240	.2995	.2646	.5641
June	"	" "	201,150	.3066	.2894	.5960
July	"	" "	172,650	.2960	.3271	.6231
August	"	" "	92,700	.3235	.2955	.6190
September	"	" "	119,500	.3106	.2837	.5943
October	"	" F-5	222,950	.3195	.2793	.5988
November	"	" "	212,950	.3084	.2570	.5654
January	1926	" F-6	157,400	.3051	.3356	.6407
February	"	" "	154,000	.2934	.3521	.6455
March	"	" "	178,200	.3011	.3613	.6624
April(?)	"	" "	173,700(?)			
June	"	" "	(?)	.2773	.3952	.6725
November	"	" "	110,418	.2831	.4204	.7035
Inventory	12/31/26	" "	(?)	.2802	.4078	.6880
March	1928	" "	(?)	.4926	.5742	1.0668
August	"	" "	13,491	.4318	.3950	.8268
November	"	" "	5,444	.7143	.7737	1.4880
April,	1929	" "	.....	....	....	....
October	"	" "	.....	....	....	....
November,	1928	" F-7 (Revised)	5,444	.7143	.7737	1.4880
October,	1930	" F-8	.....	....	....	....

(Exhibit Z-3, Page 18)

PLAINTIFF'S EXHIBIT E.

Tabulation of Cost Summary Cards.

Cost Summary Cards:					Production	Cost per Camshaft		
						Labor	Burden	Total
A-6250								
Inventory	12/31/27	(Estimate)	Ex.	F-10		.6362	.6534	1.2896
Special	2/20/28		"	"		.1173	.4277	.5450
March	1928		"	"	32,295	1.1165	1.3014	2.4179
June 1-25	"		"	"	38,664	1.0003	1.1203	2.1206
August	"		"	F-9	96,098	.8625	.7890	1.6515
October	"		"	"	117,348	.7769	.7980	1.5749
November	"		"	"	118,145	.7455	.8075	1.5530
January	1929		"	"	165,184	.7920	.7524	1.5444
March	"		"	E-1	175,960	.7251	.7396	1.4647
May	"		"	"	194,724	.6880	.7086	1.3966
July	"		"	"	198,713	.6246	.7120	1.3366
September	"		"	D	154,561	.6036	.7666	1.3702
October	"		"	"	174,545	.5743	.7466	1.3209
January	1930		"	"	90,529	.5519	.9106	1.4625
March	"		"	"	156,386	.5895	.8548	1.4443
May	"		"	E	197,713	.5668	.7652	1.3320
August	"		"	"	119,328	.5705	.9185	1.4890
October	"		"	"	93,179	.5636	.8398	1.4034
March	1931		"	"	96,815	.5486	.9271	1.4757
F-446:								
May	1925		Ex.	F-11	12,716	.7266	1.0563	1.7829
June	"		"	"	10,485	.8006	1.2520	2.0526
July	"		"	"	9,681	.8140	1.4303	2.2443
August	"		"	"	9,245	.7525	1.2479	2.0004
September	"		"	"	8,745	.7356	1.2410	1.9766
October	"		"	F-12	9,363	.7486	1.2642	2.0128
November	"		"	"	8,825	.6757	1.3316	2.0073
January	1926		"	F-13	11,995	.6789	1.0184	1.6973
February	"		"	"	12,195	.6428	.8678	1.5106
March	"		"	"	15,092	.6594	.9891	1.6485
June	"		"	"	9,645	.7601	1.4898	2.2499
November	"		"	"	4,830	.6642	2.5833	3.2475
December(?)	"		"	"	(?)	.7122	2.0366	2.7488
Inventory	12/31/26		"	"	14,475	.7281	1.8547	2.5828
March	1927		"	"	13,510	.6268	.8360	1.4628
November	"		"	"	(?)	.6563	1.0043	1.6606
March	1928		"	"	2,720	.7642	1.3450	2.1092
Blank			"	G	.....	....	....	....

(Exhibit Z-3, Page 19)

PLAINTIFF'S EXHIBIT F.

Defendant's Proration of Production Between Melling and Pioch Machines.

	Machines Available			Production Assigned		
	Melling	Pioch	Shifts	Melling	Pioch	Total
May 1930 to Feb. 3, 1931:						
May, 1930 (last half)	21	1	32 (used)	186,961	10,752	197,713
June "	21	1	62	169,489	20,832	190,321
July "	21	1	22	56,702	7,392	64,094
August "	21	1	48	103,200	16,128	119,328
Sept. "	21	1	47	94,616	15,792	110,408
Oct. "	21	1	39.5	79,907	13,272	93,179
Nov. "	21	1	36	73,022	12,096	85,118
Dec. "	21	1	26.5	52,616	8,904	61,520
Totals			313	816,513	105,168	921,681
Jan. 1931 (first half)	21	2	9		6,048	
Jan. " (last ")	21	4	18		24,192	
Total			27	32,700	30,240	62,940
Feb. 2 and 3, 1931	21	4	5	5,166	6,720	11,886
Totals, 5-16-30 to 2-3-31			345	854,379	142,128	996,507
Feb. 4 to March 15, 1931:						
Feb. 4 to 28, 1931	13	6	32	.....	75,572	75,572
March 1 to 15, "	13	6	20	.....	39,065	39,065
Totals 2-4 to 3-15-31			52	.....	114,637	114,637

Record of Shifts Operated from May 1, 1930 to March 31, 1931 and of Defendant's Claimed Production with Pioch Machines.

	Days operated				
	3 shifts	2 shifts	1 shift	Total	
May 1 to 15, 1930	9	2	2	33	
May 16 to 30, 1930	8	2	3	31	
May Total	17	4	5	64	(a)
June, 1930	16	5	4	62	
July "	6	1	2	22	
August "	12	4	4	48	
September "	11	5	4	47	
October "	9	4	5	39.5	(b)
November "	8	4	4	36	
December "	6	3	3	26.5	(b)
January, 1931	6	3	3	27	
February "	9	4	2	37	
March "	13	1	0	41	

(a) Total used is 67.

(b) Totals are reduced ½ shift, because of shorter hours in some shifts.

(Exhibit Z-3, Page 20)

PLAINTIFF'S EXHIBIT G.

Evidence of Abandonment of the Use of Melling Cam Lathes for Rough Turning the Cams upon Camshafts.

From Photostatic Copies of Defendant's Permanent Inventory of Machine Tools—Exhibits Y-1 to Y-24.

Exhibit	Manufacturer's Number	Date sent to Track 297	Date Salvaged	Other Data
Y-1	111	2- 5-31	6-18-31	
Y-2	114	2- 5-31	6-18-31	
Y-3	113	2- 5-31	6-18-31	
Y-4	115	2- 5-31	6-18-31	
Y-5 (b)	229	9-13-32		4-11-30 (a) (Still at Highland Park) 11- 9-28—Sold to Cork, Ireland
Y-6	122			
Y-7 (a)	225		11-22-34	10- 7-31 (b) Believed used to turn pump eccentric
Y-8 (a)	214		11-22-34	
Y-9 (a)	226		11-22-34	
Y-10 (a)	110	3-16-31	6-18-31	
Y-11 (a)	109	3-16-31	6-18-31	
Y-12	112	2- 5-31	6-18-31	
Y-13 (a)	106	3-16-31	6-18-31	
Y-14	116	2- 5-31	6-18-31	
Y-15 (a)	118	3-16-31	6-18-31	
Y-16	119	2- 5-31	6-18-31	
Y-17	121		6- 8-36	2- 4-29 Sold to Continental Motors Corpn. 4-23-31 Repurchased—Sent to Highland Park
Y-18 (a)	215		6- 8-36	12- 5-34 Made available at Highland Park 10- 7-31 (c)
Y-19 (b)	227	9-13-32	11-22-34	5- 5-30 (d)
Y-20 (a)	108	3-16-31	6-18-31	
Y-21 (a)	107	3-16-31	6-18-31	
Y-22 (a)	117	3-16-31	6-18-31	"Replaced by a Pioch Machine"
Y-23	120	2- 5-31	6-18-31	"Replaced by a Pioch Machine"
Y-24	105			11- 9-28 Sold to Cork, Ireland

(a) Moved 4-11-30 from J-8 in motor building to K-8 in motor building.
(b) " 10- 7-31 " " " " " " " " " " " " "
(c) " " " " " " " " " " " " " "
(d) " 5- 5-30 " " " " " " " " " " " " "

K is stated to be a machining or operating department, but information was not available as to whether or not a part of Dept. 410.

Melling Lathes that may have been available from February 4 to March 15, 1931.

Machines marked (a) above	11	
Machines marked (b) above	2	13

These machines could readily have produced the output of camshafts from February 4 to March 15, 1931.

PLAINTIFF'S EXHIBIT H.

Additional Savings Based upon Failure of Defendant to Substantiate Claims of Production by Pioch Machines During Periods When Both Melling and Pioch Machines Were or May Have Been Available.

5-16 to 12-31-30—105,168 (a) A-6250 camshafts			
at (Productive Labor saving per camshaft)	$.086694 (b)	$ 9,117.43	
at (Burden " " ")	.134914 (b)	14,188.64	
at (Total " " ")	.221608 (b)		$23,306.07
1-1 to 2-3-31—36,960 (a) A-6250 camshafts			
at (Productive Labor saving per camshaft)	$.087575 (b)	$ 3,236.77	
at (Burden " " ")	.164675 (b)	6,086.39	
at (Total " " ")	.252250 (b)		9,323.16
Total from 5-16-30 to 2-3-31		(Item one)	$32,629.23

No records were furnished by defendant, and apparently none were kept, showing actual respective production of shafts on The Melling Lathes and The Pioch Machines. Since there were 11 to 13 Melling Machines available (see Ex. G of this report) for turning all production from Feb. 3-1931 to March 15-1931, the defendants claimed production in Pioch Machines during this time is not substantiated.

2-4 to 3-15-31—114,637 (a) A-6250 camshafts			
at (Productive Labor saving per camshaft)	$.087575 (c)	$10,039.33	
at (Burden " " ")	.164675 (c)	18,877.85	
at (Total " " ")	.252250 (c)	(Item two)	$28,917.18

(a) See Exhibit F in this report.

(b) See Exhibit B in this report

(c) Same saving per shaft used as during the period from 1-1 to 2-3-31.

Note: The inclusion of the saving shown upon this sheet depends:

In Part upon the lack of sufficient actual records kept by defendant.

In Part upon acceptance of March 15, 1931 as the date upon which the use of the Melling lathes was abandoned.

EXHIBIT Z-5.

DEPRECIATION COST OF FORD CAM SHAPERS OF MODEL T TYPE AND OF MELLING CAM LATHES—FROM JUNE 16, 1925 TO FEBRUARY 3, 1931 AND FROM FEBRUARY 4, 1931 TO MARCH 15, 1931.

Ford Shapers—Model T Type:

	Depreciation Rates	Total for Periods	% To T-410	% To A-6250	Amounts for Periods T-410	Amounts for Periods A-6250
6-16-25 to 12-31-25 (6½ months)	9.5%	6,436.56	100.00		6,436.56	
Year 1926	9.5%	12,160.63	100.00		12,160.63	
1-1-27 to 10-31-27 (10 months)	10.5%	11,656.28	100.00		11,656.28	
November, 1927	10.5%	1,165.63	82.79	17.21	965.03	200.60
December, 1927	10.5%	1,165.63	51.81	48.19	603.91	561.72
Year 1928	10.5%	16,614.74	12.50	87.50	2,076.84	14,537.90
1-1-29 to 1-15-29 (½ month)	10.5%	824.42	1.66	98.34	13.69	810.73
1-15-29 to 1-31-29 (½ month)	10.5%	824.42		100.00		824.42
2-1-29 to 12-31-29 (11 months)	10.5%	18,137.28		100.00		18,137.28
Year 1930	10.5%	23,664.57		100.00		23,664.57
1-1-31 to 2-3-31 (1-1/10 months)	9.0%	1,859.36		100.00		1,859.36
		94,509.52			33,912.94	60,596.58
2-4-31 to 3-15-31 (1-4/10 months)	9.0%	2,366.46		100.00		2,366.46
		96,875.98			33,912.94	62,963.04

Melling Cam Lathes:

6-16-25 to 12-31-25 (6½ months)	9.5%	3,365.57	100.00		3,365.57	
Year 1926	9.5%	6,208.35	100.00		6,208.35	
1-1-27 to 10-31-27 (10 months)	10.5%	5,718.21	100.00		5,718.21	
November, 1927	10.5%	571.82	82.79	17.21	473.41	98.41
December, 1927	10.5%	571.82	51.81	48.19	296.26	275.56
Year 1928	10.5%	6,861.85	12.50	87.50	857.73	6,004.12
1-1-29 to 1-15-29 (½ month)	10.5%	354.17	1.66	98.34	5.88	348.29
1-15-29 to 1-31-29 (½ month)	10.5%	354.17		100.00		354.17
2-1-29 to 12-31-29 (11 months)	10.5%	7,791.84		100.00		7,791.84
Year 1930	10.5%	10,138.51		100.00		10,138.51
1-1-31 to 2-3-31 (1-1/10 months)	9.0%	796.60		100.00		796.60
		42,732.91			16,925.41	25,807.50
2-4-31 to 3-15-31 (1-4/10 months)	9.0%	1,013.85		100.00		1,013.85
		43,746.76			16,925.41	26,821.35

DEPRECIATION OF T-410 CAM SHAPERS AND OF MELLING CAM LATHES REQUIRED FOR PRODUCTION OF F-446 SHAFT.

From June 16, 1925 to March 31, 1928.

Shapers:

Assuming that 1½ times as many shapers as Melling Lathes would have been required (same proportion as for T-410).			
No. of shapers		3	
Cost of shapers 3 x $6,000.00			18,000.00
		Percent	
Depreciation:			
6-15-25 to 12-31-25		5.15	927.00
1926		9.50	1,710.00
1927		10.50	1,890.00
1st quarter of 1928—10.5 ÷ 4		2.625	472.50
			4,999.50

Melling Cam Lathes:

Brass Tag No.			
32067	Cost 2- 9-24	4,121.57	
37001	" 5-29-24	3,973.19	8,094.76
		Percent	
Depreciation:			
6-15-25 to 12-31-25		5.15	416.88
1926		9.50	769.00
1927		10.50	849.95
1st quarter of 1928—10.5 ÷ 4		2.625	212.49
			2,248.32

EXHIBIT Z-6.

MAINTENANCE—T-410 SHAFT.

For Period from June 16, 1925 to May 31, 1927.

Ford Cam Shapers:

Shift Numbers	Number of hours worked	Number of men in maintenance crew	Average Direct Labor Rates	Amount (for 13 shapers)	Proportional increase for 9 additional shapers	Amount (for 22 shapers)
1.	1922	1	.8587	1,650.42	1,142.60	2,793.01
2.	1922	2	.8587	3,300.84	2,285.20	5,586.04
3.	1922	2	.8587	3,300.84	2,285.20	5,586.04
	5766			8,252.10	5,713.00	13,965.09

Melling Cam Lathes:

					Foundry Tool Room (a)	
1.	1922	1	.8587	1,650.42	.....	1,650.42
2.	1922	4	.8587	6,601.69	3,300.84	9,902.53
3.	1922	4	.8587	6,601.69	3,300.84	9,902.53
	5766			14,853.80	6,601.68	21,455.48

(a) There were 2 men in Foundry tool room on each of two shifts, who repaired slides. The proportion of their time so occupied was not stated. Above includes all of their time.

ALL overhauling of Melling cam lathes was performed in production department and by the above maintenance crew. Therefore overhaul expense is included in above total for Melling lathes.

Each shaper was removed from the production department once a year, taken to the MAIN tool room and completely overhauled by an entirely different set of men.

Proportion of this overhaul chargeable to T-410 (P. 4) 29,000.00

Recapitulation:

Shapers—Maintenance	13,965.09	
Overhaul (p. 4)	29,000.00	42,965.09
Melling Lathes—Maintenance	21,455.48	
Overhaul (included in Maintenance)	.....	21,455.48

MAINTENANCE—A-6250 SHAFT.

For the Period from November 1, 1927 to February 3, 1931.

Ford Cam Shapers:

Shift Number	Number of hours worked	Number of hours at eight hours per shift	Number of men in Maintenance crew	Average Direct Labor Rates	Amounts (for 13 shapers)	Proportional increase for 14 additional shapers	Amount (for 27 shapers)
1	648	5,184	1	.8951	4,640.20	4,997.14	9,637.34
2	730	5,840	2	.8951	10,454.77	11,258.98	21,713.75
3	708	5,664	2	.8951	10,139.69	10,919.66	21,059.35
		16,688			25,234.66	27,175.78	52,410.44

Melling Cam Lathes:

						Foundry Tool Room (a)	
1	648	5,184	1	.8951	4,640.20	—	4,640.20
2	730	5,840	4	.8951	20,909.54	10,454.77	31,364.31
3	708	5,664	4	.8951	20,279.38	10,139.69	30,419.07
		16,688			45,829.12	20,594.46	66,423.58

(a) There were 2 men in Foundry tool room on each of two shifts who repaired slides. The proportion of their time so occupied was not stated.
Above includes ALL of their time.

ALL overhauling of Melling cam lathes was performed in production department and by the above maintenance crew. Therefore overhead expense is included in above total for Melling lathes.

Each shaper was removed from the production department once a year, taken to MAIN tool room and completely overhauled by an entirely difference set of men.

Proportion of this overhead chargeable to A-6250 (P. 4) 40,000.00

Recapitulation:

Shapers—Maintenance	52,410.44	
Overhaul	40,000.00	92,410.44
Melling Lathes—Maintenance	66,423.58	
Overhaul (included in Maintenance)	—	66,423.58

Note: The hours worked appear excessive in this sheet. This because full maintenance crew is assumed out every shift. If production per shift was 2913 in April, 1930 and only 1541 per shift in September, 1928, a considerably smaller number of machines would have been required during the latter month and the whole maintenance crew would not have been required.

MAINTENANCE—F-446 SHAFT.

For the Period from June 15, 1925 to March 31, 1928.

If 22 shapers would have been required for T-410 shafts and 3 for F-446 shafts, during the same period of time, the maintenance can be estimated for F-446 as 3/22 of that for T shafts or 13.64%.
As the production period for T shafts selected for maintenance calculation was from 6-16-25 to 5-31-27, 23½ months, and the production period for F-446 shafts was from 6-16-25 to 3-31-28, a period of 33½ months, the time for F-446 should be increased proportionally or by 43.55%.

.1364 x 1.4355 — 19.58 — percentage of T-410 maintenance cost used for F-446.

Shapers—Maintenance—$13,965.09 x .1958		2,734.36
Melling Lathes—Maintenance and Tool Men, $21,455.48 x .1958		4,200.98

Recapitulation:

Shapers—Maintenance	2,734.36	
Overhaul (P. 4)	4,250.00	6,984.36
Melling Lathes—Maintenance		
Overhaul (included in Maintenance) ..		4,200.98

OVERHAUL EXPENSE.

Overhauling of Melling cam lathes was done by maintenance crew in Dept. 410. Therefore cost of overhauling is included in maintenance cost.

In the case of the Ford Shapers, however, each machine was removed bodily from Department 410 once each year, taken to the *main* tool room and completely overhauled by men not connected with Dept. 410.

No cost of those overhauls has been supplied, but a complete overhaul of expensive machines such as the shapers may well have averaged $1,000. It would hardly be less than $500. If in the absence of information, the average overhaul cost is estimated at $500, the following additional cost would be chargeable to the shapers:

	Number of Shaper Overhauls			Cost of Overhauling			
Period	T-410	A-6250	F-446	T-410	A-6250	F-446	Total
6/15 to 12/31/25.	12(a)	—0—	1.5	6,000.00	—0—	750.00	6,750.00
1926	22	—0—	3	11,000.00	—0—	1,500.00	12,500.00
1927	21	1	3	10,500.00	500.00	1,500.00	12,500.00
1928	3	19	1(b)	1,500.00	9,500.000	500.00	11,500.00
1929	0	30	—0—	—0—	15,000.00	—0—	15,000.00
1930	0	30	—0—	—0—	15,000.00	—0—	15,000.00
Totals				29,000.00	40,000.00	4,250.00	73,250.00

(a)—6½/12 of 22.

(b)—3 months.

No overhauling shown for 1931 as machines were abandoned by March 15.

EXHIBIT Z-7.

COST OF TOOLS—INCLUDING GRINDING FORD SHAPERS OF T-410 TYPE AND MELLING CAM LATHES.

Type	Shafts Produced	Cost per Shaft		Total Cost	
		Ford Shapers	Melling Lathes	Ford Shapers	Melling Cam Lathes
T-410	3,420,166	.00300	.00087	10,260.50	2,975.54
A-6250	4,222,999	.00344	.00100	14,527.12	4,223.00
F-446	275,664	.00556	.00161	1,532.69	443.82
				26,320.31	7,642.36

See page 2 for details.

COST OF TOOLS, INCLUDING GRINDING.

Ford Cam Snapers:

Ex. 9(g) of Defendant's Statement of Account gives tool cost per T-410 camshaft (based on record for 1922 and 1923) as			.00270	
Grinding Cost—P. 1765 of typewritten record of hearing beginning January 16, 1939, states that grinding 12 tools requires 15 man minutes—15 minutes at 90¢ per hour		$ .225		
Grinding cost of 8 tools—2/3 of .225 or		$ .15		
Assuming 500 shafts per set of 8 tools, grinding cost of tools per each T-410 shaft ($.15 ÷ 500)			.00030	.00300
Total tool cost per T-410 shaft				
Had it been possible to use T-410 shapers for the large bearing shafts, cost would probably been proportional to areas of cams				
A-6250 — 1.14640 x T-410	.00344			
F-446 — 1.85287 x T-410	.00556			

Melling Lathes:

Cost of 8 tools (per Ex. 8(h) of Defendant's Statement of Account)	$2.00			
Hours of life (per do.)	200			
Production per machine hour—T-410	37.5			
T-410 camshafts per tool life—37.5 x 200, or 7500				
Cost per T-410 camshaft $2.00 ÷ 7500			.00027	
Grinding Cost. P. 1765 of typewritten record of hearing beginning January 16, 1939, states that grinding 12 tools requires 30 man minutes.				
30 minutes at 90¢ per hour		$ .45		
Grinding cost of 8 tools—2/3 of .45 or		$ .30		
Assuming 500 shafts per set of 8 tools, grinding cost of tools per each T-410 shaft ($.30 ÷ 500)			.00060	
Total cost per T-410 shaft				.00087
A-6250 — 1.14640 x T-410	.00100			
F-446 — 1.85287 x T-410	.00161			

NO.

CASH OR CHG.

CLASS OF SERVICE DESIRED			
DOMESTIC		CABLE	
TELEGRAM	X	FULL RATE	
DAY LETTER		DEFERRED	
NIGHT MESSAGE		CABLE LETTER	
NIGHT LETTER		WEEK END LETTER	

Patrons should check class of service desired; otherwise message will be transmitted as a full-rate communication.

WESTERN UNION

NEWCOMB CARLTON, PRESIDENT J. C. WILLEVER, FIRST VICE-PRESIDENT

NO.	CASH OR CHG.
CHECK	
TIME FILED	

1206 A

Send the following message, subject to the terms on back hereof, which are hereby agreed to

#CC
28
3/19/35

MILWAUKEE WISCONSIN NOVEMBER 18 1930

FORD MOTOR COMPANY
ATTENTION HENRY FORD
DETROIT MICHIGAN

RE GORDON PATENT NUMBER ONE FIVE FOUR TWO EIGHT NAUGHT THREE RELATING TO CAMSHAFT LATHES AND ADJUDICATED SIXTH CIRCUIT COURT OF APPEALS GORDON FORM LATHE COMPANY PATENT OWNER HAS CONCLUDED SETTLEMENT WITH GENERAL MOTORS AND OTHER AUTOMOBILE COMPANIES FOR PAST AND LICENSE FOR FUTURE STOP HAVE BEEN INSTRUCTED TO FILE SUIT AGAINST YOUR COMPANY STOP PAPERS READY FOR FILING BUT BEFORE PROCEEDING WITH SUIT PROPOSE CONFERENCE WITH YOUR ATTORNEYS TO DISCUSS POSSIBILITIES OF SETTLEMENT WITH YOUR COMPANY STOP SHALL EXPECT REPLY TOMORROW NINETEENTH

BOTTUM HUDNALL LECHER MCNAMARA AND MICHAEL

CHG SENDER

NOTE: REPORT DELIVERY OF TELEGRAM

WESTERN UNION MESSENGERS ARE AVAILABLE FOR THE DELIVERY OF NOTES AND PACKAGES

PLAINTIFF'S EXHIBIT NO. CC

PATRONS ARE REQUESTED TO FAVOR THE COMPANY BY CRITICISM AND SUGGESTION CONCERNING ITS S

CLASS OF SERVICE

This is a full-rate Telegram or Cablegram unless its deferred character is indicated by a suitable sign above or preceding the address.

WESTERN UNION

NEWCOMB CARLTON, PRESIDENT J. C. WILLEVER, FIRST VICE-PRESIDENT

1930 NOV 18 PM 4 14

The filing time as shown in the date line on full-rate telegrams and day letters, and the time of receipt at destination as shown on all messages, is STANDARD TIME.

Received at First Wis. Nat. Bank Bldg., Milwaukee, Wis.

DD
7/9/38

AU126 13 COLLECT=DETROIT MICH 18 456P

BOTTUM HUDNALL LECHER MCNAMARA & MICHAEL=

ASKING R D FM=

YOUR FORD MOTOR CO DELIVERED OVER PRIVATE WIRE 220 PM=

WESTERNUNION=

THE QUICKEST, SUREST AND SAFEST WAY TO SEND MONEY IS BY TELEGRAPH OR CABLE

PLAINTIFF'S EXHIBIT NO. DD

PLAINTIFF'S EXHIBIT RR

THE GORDON FORM LATHE CO.
AGREEMENT FILE

MEMORANDUM OF AGREEMENT made and entered into by and between GORDON FORM LATHE COMPANY, an Ohio Corporation, hereinafter called "GORDON", and CHRYSLER CORPORATION, a Delaware corporation, hereinafter called "CHRYSLER".

WITNESSETH

WHEREAS, Gordon is the owner of the entire right, title and interest in and to Letters Patent of the United States No. 1,542,803, dated June 16, 1925, covering an improved Lathe; and

WHEREAS, in an action entitled "Gordon Form Lathe Company versus Walcott Machine Company", decided by the United States Circuit Court of Appeals for the Sixth Circuit on April 12, 1929, said patent as to certain of its claims was held valid and infringed by certain cam turning and crank shaft contour lathes heretofore manufactured and sold by the Walcott Machine Company of Jackson, Michigan; and

WHEREAS, Chrysler Corporation has heretofore purchased and used, and is now using certain of said infringing lathes manufactured by the said Walcott Machine Company and now desires to free and release said lathes for the future from infringement of said Letters Patent.

NOW, THEREFORE, for and in consideration of One Dollar ($1.00) by each of the parties to the other in hand paid, receipt whereof is hereby acknowledged, and other valuable considerations, each of the parties to the other moving, the said parties have covenanted and agreed as follows:

FIRST: Gordon hereby releases and frees from infringement of said Letters Patent of the United States

No. 1,542,803, the hereinafter identified cam turning lathes, now in the possession of said Chrysler Corporation, said release to take effect as of April 12, 1929, and to continue throughout the life of said lathes; the lathes so released being the following:

Chrysler Number	Maker's Serial Number
C. M. 3553	127
C. M. 3016	101
C. M. 5803	182
H. 837	200
H. 838	202
H. 2841	213
E. 3155	53
E. 4564	136
9860	65
9920	57
10141	55
10150	54
11635	89
13035	126
17079	161
17112	162

Second: Gordon agrees that it will issue a similar license unto Chrysler for such other and further machines as Chrysler may acquire and request a license for upon payment by Chrysler to Gordon of the sum of Three Thousand Dollars ($3,000) for each such machine; provided, however, that if any such machine shall be intended for use upon shafts for less than six cylinder machines, the payment required shall be only Two Thousand Dollars ($2,000) per machine.

Third: In consideration of the foregoing release, the said Chrysler Corporation agrees to pay Gordon, upon execution of this agreement, the sum of Forty Six Thousand Dollars ($46,000), such payment being at the rate

of Three Thousand Dollars ($3,000) per lathe, except as to machine numbers 9860 and 9920, which are intended for use in turning cam shafts for four cylinder engines, the rate for such machines being Two Thousand Dollars ($2,000) each, and in addition to grant Gordon a non-exclusive, non-assignable license under Letters Patent of the United States No. 1,246,191, dated November 13, 1917.

FOURTH: It is distinctly understood and agreed that the release under clause FIRST hereof applies only to the use of said lathes subsequent to the effective date of said release, viz:—April 12, 1929; Gordon expressly reserving unto itself, its successors and assigns, any and all claims it now has, or may hereafter acquire, for, or arising out or by reason of the infringement of its said patent by the said Chrysler Corporation through the use of said lathes or any other infringing lathes at or during any time prior to April 13, 1929.

FIFTH: It is further agreed that in the event of litigation directed to a recovery for infringement of said patent No. 1,542,803 prior to April 13, 1929, neither party hereto shall in any wise use this agreement as affecting the measure of damages for such infringement.

SIXTH: It is further agreed that Gordon, or its duly appointed representative or attorney, shall have access to the manufacturing plants of Chrysler following the execution of this agreement for the purpose of verifying the number of infringing lathes in use or in the possession of said Chrysler Corporation and the identifying markings thereon, as set forth under clause FIRST hereof.

SEVENTH: The said Chrysler Corporation acknowledges and acquiesces in the validity of said Letters Patent No. 1,542,803, but only as to those claims sustained in said litigation, and covenants and agrees that it will not in any proceeding, either in equity or at law, directly or indirectly, deny or contest its validity or assert its invalidity.

EIGHTH: Gordon further agrees that it will not grant a similar license or release to any other person, firm or corporation for a sum of money less than that herein agreed upon per machine; it being understood and agreed that if this undertaking shall be violated, then Chrysler shall be entitled to a similar rate both as to machines herein enumerated and as to any other machines which it may hereafter request license for.

NINTH: It is mutually understood and agreed by and between the parties that in the event said patent No. 1,542,803 shall be sold or otherwise disposed of to any person, firm or corporation for the benefit or in consideration of money furnished by any group of automotive manufacturers, Chrysler shall be given an opportunity to join with said group of automotive manufacturers, and to apply any moneys paid to Gordon under the terms of this agreement toward the purchase price of said patent; it being understood, however, that in the event Chrysler shall elect to so join with such group of manufacturers and have said moneys applied to said purchase price, then the license and release herein granted shall be void and of no effect.

TENTH: This agreement shall be binding upon and inure to the benefit of the respective successors and assigns of the parties hereto.

Signed, sealed and delivered this 17th day of July, 1929.

GORDON FORM LATHE COMPANY

By CHAS. GORDON,
President.

Attest:

.....
Secretary.

CHRYSLER CORPORATION

By K. T. KELLER,
Vice President.

Attest:

.... MORRISON,
Secretary.

Copy

December 16, 1929

The White Motor Company,
842 E. 79th Street,
Cleveland, Ohio.

Attention—Mr. Cooper

RE: *Gordon Cam Lathe Patent*

Dear Mr. Cooper:

I have been expecting to hear from you on the matter of settlement which we discussed in Mr. Richey's office some few weeks ago. We have now instituted some suits and are preparing to extend our activities in that direction and would like to have a definite expression from you as to what The White Company proposes to do in the matter.

Very truly yours,

BOTTUM HUDNALL LECHER
McNAMARA & MICHAEL

By

JWM HH

#HH
LJB
7/19/38

Copy

THE WHITE MOTOR COMPANY
Manufacturers of
WHITE TRUCKS AND BUSSES

WALTER C. WHITE, President
GEORGE H. KELLY, Treasurer
T. R. DAHL, Secretary

Cleveland, Ohio
December 24, 1929.

Mr. J. W. Michael,
Bottum, Hudnall, Lecher, McNamara & Michael
Trust Company Building,
Milwaukee, Wis.

Re: *Gordon Cam Lathe Patent*

Dear Sir:

Your letter of December 16, 1929, has been received.

We would like to effect a settlement both for the past and the future, and are herewith submitting the data which you requested during our discussion of this subject in Mr. Richey's office.

Number of crankshaft contour machines owned by the White Motor Company....	0
Number of cam cutting machines owned by the White Motor Company..... (Both of the 4-cylinder camshaft type)	2
Number of cams cut prior to July 1, 1925	0
Number of cams cut from July 1, 1925, to June 12, 1929 (37,919 camshafts).....	303,352
Number of cams cut from June 12, 1929, to Dec. 21, 1929 (3,013 camshafts).....	24,104

We do not believe that we were given proper and adequate notice of infringement prior to June 12, 1929, but in order to effect an early and complete settlement of this matter we are willing to pay the Gordon Form Lathe Company the sum of Five Thousand Dollars ($5,000), the same to cover both past damages and the future release of our two machines.

Please let us have an early reply.

Yours very truly,

THE WHITE MOTOR COMPANY
/s/ R. M. Cooper
Patent Engineer.

R. M. Cooper

RMC:hb

Copy

December 27, 1929

The White Motor Company,
842 E. 79th Street,
Cleveland, Ohio.

Attention—Mr. R. N. Cooper, Patent Engineer

Dear Mr. Cooper:

In view of agreements, both executed and pending, we are not in a position to release your infringing machines for less than the sum of $2,000.00 per each 4-cylinder cam shaft type nor, in respect of the past, are we in a position to accept less than ¾ths of a cent per cam.

Your present offer of $5,000.00, as embodied in your letter of December 24th, covers the $2,000.00 release for each of the two machines you report but only leaves

$1,000.00 to apply on the past, which figures about 1/3 of a cent per cam. At ¾ths of a cent per cam, the total amount, including the release of each machine and the past, would, on the statement you have submitted, amount to $6,455.92.

We are agreeable to settling the matter with you on this basis to cover both the past and the release of the machines for the future or, if you prefer, are agreeable to releasing your two machines on the basis of $2,000.00 per machine and reserving the past for future determination.

We have every reason to believe that ¾ths of a cent per cam is but a very small percentage of the actual savings resulting from the use of the Gordon invention.

Please let us hear from you promptly.

Very truly yours,

BOTTUM HUDNALL LECHER
McNAMARA & MICHAEL

By

JWM HH
c. c. to Mr. Richey and
Mr. Gordon

Copy

THE WHITE MOTOR COMPANY
Manufacturers of
WHITE TRUCKS AND BUSSES

WALTER C. WHITE, President
GEORGE H. KELLY, Treasurer
T. R. DAHL, Secretary

Cleveland, Ohio
January 16, 1930.

Mr. J. W. Michael
Bottum, Hudnall, Lecher, McNamara & Michael
Milwaukee, Wisconsin.

Re: *Gordon Cam Lathe Patents*

Dear Sir:

We have decided, in case we can secure a satisfactory agreement, to accept your offer to release our two machines on the basis of Two Thousand Dollars ($2,000) per machine, leaving the matter of past infringement for future determination. We, therefore, request that you submit to us an agreement covering such release.

An agreement similar to the one which the Gordon Form Lathe Company executed with the Chrysler Corporation will be acceptable to us, with the addition of a clause which will permit us upon payment of an additional One Thousand Dollars ($1,000) per machine to convert either or both of our machines into machines for use upon shafts for six or more cylinder engines.

Yours very truly,

THE WHITE MOTOR COMPANY
/s/ R. M. COOPER
R. M. Cooper
Patent Engineer.

RMC:hb
cc—Messrs. Church
Dahl

1536

(Copy)

January 18th,
1930

The White Motor Company
Cleveland
Ohio

Attention—R. M. Cooper, Patent Engineer.

Gentlemen:

Replying to your letter of January 16th, we have prepared and enclose an agreement covering the release of your two machines.

While we are quite willing, as stated in one of our previous letters, to leave the matter of past infringement for future determination, we feel that you should know that we will be unwilling to settle with you for the past on the 3/4ths of a cent basis if we are forced to file suit. In such event, we shall insist upon and endeavor to collect all that the law allows, which, according to our calculations, is substantially greater than the rate of 3/4ths of a cent per cam.

Please execute both copies of the agreement and return to us with your check for Four Thousand ($4,000.00) Dollars. We shall then have the agreement executed by the Gordon Form Lathe Company and one copy returned to you.

Very truly yours,

BOTTUM HUDNALL LECHER
McNAMARA & MICHAEL

By:

JWM HH
encls.

(Copy)

THE WHITE MOTOR COMPANY
Manufacturers of
WHITE TRUCKS AND BUSSES

WALTER C. WHITE, President
GEORGE H. KELLY, Treasurer
T. R. DAHL, Secretary

Cleveland, Ohio
February 4, 1930.

Mr. J. W. Michael
Bottum, Hudnall, Lecher, McNamara & Michael
Milwaukee, Wisconsin.

Dear Sir:

Please find herewith, duly executed by us, two copies of an agreement for the future release of our two cam turning machines.

Please also find enclosed two copies of an agreement releasing us from all claims and demands for past infringement.

The enclosed agreements are identical with the agreements submitted to us, except that the agreement for the future release of our two machines has been amended, for the purpose of eliminating an intervening period between the effective dates of the two agreements, to become effective on the same date as the agreement releasing us from past infringement, viz., December 21, 1929.

We believe that the above amendment will meet with your approval, and are enclosing herewith our check for Six Thousand Four Hundred Fifty-five Dollars and

ninety-two cents ($6,455.92), the sum of the amounts set forth in the two agreements.

Yours very truly,

THE WHITE MOTOR COMPANY
/s/ R. M. Cooper

R. M. Cooper
Patent Engineer.

RMC:hb
Encs.

(Copy)

February 8th, 1930.

The White Motor Company
Cleveland
Ohio

Attention—Mr. Cooper, Patent Engineer
re: *Gordon Patent*

Gentlemen:

Your letter of February 4th, enclosing signed agreements and check in the above matter, was duly received.

The agreement and the release for the past have now been executed by The Gordon Form Lathe Company and the originals thereof are enclosed to you herewith. The executed duplicates are retained for onr files.

The Secretary of The Gordon Company is located in Cincinnati and we have not deemed it necessary to forward the papers to him for signature, but will do so if you insist. The Secretary's signature has not appeared on previous agreements of the same character and, of course, is not necessary.

Thanking you for your cooperation in this matter, we remain,

Very truly yours,

BOTTUM HUDNALL LECHER
McNAMARA & MICHAEL
By:

JWM HH
Encl.

(Copy)

THE WHITE MOTOR COMPANY
Manufacturers of
WHITE TRUCKS AND BUSSES

WALTER C. WHITE, President
GEORGE H. KELLY, Treasurer
T. R. DAHL, Secretary

Cleveland, Ohio
February 12, 1930,

Mr. J. W. Michael
Bottum, Hudnall, Lecher, McNamara & Michael
Milwaukee, Wisconsin.

Re: *Past and future infringement of the Gordon Patent* 1,542,803

Dear Sir:

This will acknowledge the receipt of your letter of February 8th, enclosing executed copies of the Agreement and Release in the above matter.

Yours very truly,

THE WHITE MOTOR COMPANY
/s/ R. M. COOPER
R. M. Cooper
Patent Engineer.

RMC:hb

1540

#GG
LJB
7/19/38

FOR AND IN CONSIDERATION of Twenty-four Hundred Fifty-five Dollars and Ninety-two Cents ($2,455.92), the undersigned, GORDON FORM LATHE COMPANY, an Ohio Corporation, owner of the entire right, title and interest in and to Letters Patent of the United States No. 1,542,803, dated June 16th, 1925, covering an improved Lathe, hereby releases and forever discharges THE WHITE MOTOR COMPANY, an Ohio Corporation of Cleveland, Ohio, from all claims and demands for past infringement of said patent No. 1,542,803, by reason of its use and the Two (2) 4-cylinder cam shaft type infringing lathes identified in Agreement of even date herewith, releasing said machines for future use.

DATED this 21st day of December, 1929.

GORDON FORM LATHE COMPANY
By CHAS. GORDON,
President.

MEMORANDUM OF AGREEMENT made and entered into by and between GORDON FORM LATHE COMPANY, an Ohio Corporation, hereinafter called "GORDON", and THE WHITE MOTOR COMPANY, an Ohio Corporation, hereinafter called "WHITE".

WITNESSETH

WHEREAS, Gordon is the owner of the entire right, title and interest in and to Letters Patent of the United States No. 1,542,803, dated June 16, 1925, covering an improved lathe; and

WHEREAS, in an action entitled "Gordon Form Lathe Company versus Walcott Machine Company", decided by the United States Circuit Court of Appeals for the

Sixth Circuit on April 12, 1929, said patent as to certain of its claims was held valid and infringed by certain cam turning and crank shaft contour lathes heretofore manufactured and sold by the Walcott Machine Company of Jackson, Michigan; and

WHEREAS, White has heretofore purchased and used, and is now using certain of said infringing lathes manufactured by the said Walcott Machine Company and now desires to free and release said lathes for the future from infringement of said Letters Patent.

NOW, THEREFORE, for and in consideration of One Dollar ($1.00) by each of the parties to the other in hand paid, receipt whereof is hereby acknowledged, and other valuable considerations, each of the parties to the other moving, the said parties have covenanted and agreed as follows:

FIRST: Upon the representation of White that the infringing lathes it desires to free and release are for use only upon cam shafts for less than 6-cylinder engines, Gordon hereby releases and frees from infringement of said Letters Patent of the United States No. 1,542,803 at the rate hereinafter specified, the following identified cam turning lathes now in the possession of White, said release to take effect as of December 21, 1929, and to continue throughout the life of said lathes:

WHITE NUMBER	MAKER'S SERIAL NUMBER
2582	134
1912	157

SECOND: Gordon agrees that it will issue a similar license unto White for such other and further machines as White may acquire and request a license for upon payment by White to Gordon of the sum of Three Thousand ($3,000.00) Dollars for each such machine for use upon cam shafts for six (6) or more cylinder engines and Two Thousand ($2,000.00) Dollars for each such machine for use upon cam shafts for less than 6-cylinder engines.

THIRD: In consideration of the foregoing release, White agrees to pay Gordon, upon execution of this agreement, the sum of Four Thousand ($4,000.00) Dollars, such payment being at the rate of Two Thousand ($2,000.00) Dollars per lathe. It is agreed that White may convert either or both of said machines into machines for use upon cam shafts for six (6) or more cylinder engines upon payment of an additional One Thousand ($1,000.00) Dollars per machine and White agrees that in the event of conversion, it will make such additional payment unto Gordon within Twenty (20) days following the conversion.

FOURTH: It is distinctly understood and agreed that the release under Clause FIRST hereof applies only to the use of said lathes subsequent to the date of execution hereof; Gordon expressly reserving unto itself, its successors and assigns any and all claims it now has or may hereafter acquire, for, or arising out or by reason of the infringement of its patent by White through the use of said lathes or any other infringing lathes at or during any time prior to the date hereof.

FIFTH: It is further agreed that in the event of litigation directed to a recovery for infringement of said patent No. 1,542,803 prior to the date hereof, neither party hereto shall in any wise use this agreement as affecting the measure of damages for such infringement.

SIXTH: It is further agreed that Gordon, or its duly appointed representative or attorney, shall have access to the manufacturing plants of White, following the execution of this agreement, for the purpose of verifying the number of infringing lathes in use or in the possession of White and the identifying markings thereon as set forth under Clause FIRST hereof.

SEVENTH: White acknowledges and acquiesces in the validity of said Letters Patent No. 1,542,803, but only as to those claims sustained in said litigation, and coven-

ants and agrees that it will not in any proceeding, either in equity or at law, directly or indirectly, deny or contest its validity or assert its invalidity.

EIGHTH: Gordon further agrees that it will not grant a similar license or release to any other person, firm or corporation for a sum of money less than that herein agreed upon per machine; it being understood and agreed that if this undertaking shall be violated, then White shall be entitled to a similar rate, both as to machines herein enumerated and as to any other machines which it may hereafter request license for.

NINTH: It is mutually understood and agreed by and between the parties that in the event said patent No. 1,542,803 shall be sold or otherwise disposed of to any person, firm or corporation for the benefit or in consideration of money furnished by any group of automotive manufacturers, White shall be given an opportunity to join with said group of automotive manufacturers, and to apply any moneys paid to Gordon under the terms of this agreement toward the purchase price of said patent; it being understood, however, that in the event White shall elect to so join such group of manufacturers and have said moneys applied to said purchase price, then the license and release herein granted shall be void and of no effect.

TENTH: This agreement shall be binding upon and inure to the benefit of the respective successors and assigns of the parties hereto.

Signed, sealed and delivered this 6th day of February, 1930.

GORDON FORM LATHE COMPANY

Attest:

..... By CHAS. GORDON,
Secretary. President.

THE WHITE MOTOR COMPANY

Attest:

T. R. DAHL, By SAUNDERS JONES,
Secretary. Vice President.

MEMORANDUM OF AGREEMENT made and entered into by and between GORDON FORM LATHE COMPANY, an Ohio Corporation, hereinafter called "GORDON", and J. I. CASE COMPANY, a Wisconsin Corporation, hereinafter called "CASE".

WITNESSETH

WHEREAS, Gordon is the owner of the entire right, title and interest in and to Letters Patent of the United States No. 1,542,803, dated June 16, 1925, covering an improved lathe; and

WHEREAS, in an action entitled "Gordon Form Lathe Company versus Walcott Machine Company", decided by the United States Circuit Court of Appeals for the Sixth Circuit on April 12, 1929, said patent as to certain of its claims was held valid and infringed by certain cam turning and crank shaft contour lathes heretofore manufactured and sold by the Walcott Machine Company of Jackson, Michigan; and

WHEREAS, Case has heretofore purchased and used, and is now using certain of said infringing lathes manufactured by the said Walcott Machine Company and now desires to free and release said lathes for the future from infringement of said Letters Patent.

NOW, THEREFORE, for and in consideration of One Dollar ($1.00) by each of the parties to the other in hand paid, receipt whereof is hereby acknowledged, and other valuable considerations, each of the parties to the other moving, the said parties have covenanted and agreed as follows:

FIRST: Upon the representation of Case that the infringing lathes it desires to free and release are for use only upon cam shafts for less than 6-cylinder engines, Gordon hereby releases and frees from infringement of said Letters Patent of the United States No. 1,542,803 at the rate hereinafter specified, the following identified cam turning lathes now in the possession of Case, said

release to take effect as of February 18th, 1930, and to continue throughout the life of said lathes:

Case Number	Maker's Serial Number
SW 5081	209
SW 5227	221

Second: Gordon agrees that it will issue a similar license unto Case for such other and further machines as Case may acquire and request a license for upon payment by Case to Gordon of the sum of Three Thousand ($3,000.00) Dollars for each such machine for use upon cam shafts for six (6) or more cylinder engines and Two Thousand ($2,000.00) Dollars for each such machine for use upon cam shafts for less than 6-cylinder engines.

Third: In consideration of the foregoing release, Case agrees to pay Gordon, upon execution of this agreement, the sum of Four Thousand ($4,000.00) Dollars, such payment being at the rate of Two Thousand ($2,000.00) Dollars per lathe. It is agreed that Case may convert either or both of said machines into machines for use upon cam shafts for six (6) or more cylinder engines upon payment of an additional One Thousand ($1,000.00) Dollars per machine and Case agrees that in the event of conversion, it will make such additional payment unto Gordon within Twenty (20) days following the conversion.

Fourth: It is distinctly understood and agreed that the release under Clause First hereof applies only to the use of said lathes subsequent to the date of execution hereof; Gordon expressly reserving unto itself, its successors and assigns any and all claims it now has or may hereafter acquire, for, or arising out or by reason of the infringement of its patent by Case through the use of said lathes or any other infringing lathes at or during any time prior to the date hereof.

Fifth: It is further agreed that in the event of liti-

gation directed to a recovery for infringement of said patent No. 1,542,803 prior to the date hereof, neither party hereto shall in any wise use this agreement as affecting the measure of damages for such infringement.

SIXTH: It is further agreed that Gordon, or its duly appointed representative or attorney, shall have access to the manufacturing plants of Case, following the execution of this agreement, for the purpose of verifying the number of infringing lathes in use or in the possession of Case and the identifying markings thereon as set forth under Clause FIRST hereof.

SEVENTH: Case acknowledges and acquiesces in the validity of said Letters Patent No. 1,542,803, but only as to those claims sustained in said litigation, and covenants and agrees that it will not in any proceeding, either in equity or at law, directly or indirectly, deny or contest its validity or assert its invalidity.

EIGHTH: Gordon further agrees that it will not grant a similar license or release to any other person, firm or corporation for a sum of money less than that herein agreed upon per machine; it being understood and agreed that if this undertaking shall be violated, then Case shall be entitled to a similar rate, both as to machines herein enumerated and as to any other machines which it may hereafter request license for.

NINTH: It is mutually understood and agreed by and between the parties that in the event said patent No. 1,542,803 shall be sold or otherwise disposed of to any person, firm or corporation for the benefit or in consideration of money furnished by any group of automotive manufacturers, Case shall be given an opportunity to join with said group of automotive manufacturers, and to apply any moneys paid to Gordon under the terms of this agreement toward the purchase price of said patent; it being understood, however, that in the event Case shall elect to so join with such group of manufac-

turers and have said moneys applied to said purchase price, then the license and release herein granted shall be void and of no effect.

TENTH: This agreement shall be binding upon and inure to the benefit of the respective successors and assigns of the parties hereto.

Signed, sealed and delivered this 18th day of February, 1930.

GORDON FORM LATHE COMPANY
By CHAS. GORDON,
President.

Attest:
THEO. JOHNSON,
Secretary.

J. I. CASE COMPANY
By JOS. BIGGERT,
Vice President.

Also introduced as
Ex. F F
LJB
7/19/38

FOR AND IN CONSIDERATION of Ten Hundred Fifty-five Dollars and Twenty-eight Cents ($1,055.28), figured at the rate of ¾ths of a cent per cam on a total production of 140,704 cams turned on infringing machines intervening between November 22nd, 1928, the date of the first installation, and February 18th, 1930, the date of this release, the undersigned, The Gordon Form Lathe Company, an Ohio Corporation, owner of the entire right, title and interest in and to Letters Patent of the United States No. 1,542,803, dated June 16th, 1925, covering an improved lathe, hereby releases and forever discharges the J. I. Case Company, a Wisconsin Corporation of Racine, Wisconsin, from all claims and demands for past infringement of said patent by reason of its use of the

Two (2) four-cylinder cam shaft type infringing lathes identified in an agreement of even date herewith, releasing said machines for future use.

DATED this 18th day of February, 1930.

GORDON FORM LATHE COMPANY
By CHAS. GORDON,
President.

MEMORANDUM OF AGREEMENT made and entered into by and between GORDON FORM LATHE COMPANY, an Ohio corporation, hereinafter called "GORDON", and THE NASH MOTORS COMPANY, a Maryland corporation, hereinafter called "NASH",

WITNESSETH:

WHEREAS, Gordon is the owner of the entire right, title and interest in and to Letters Patent of the United States No. 1,542,803, dated June 16, 1925, covering an improved Lathe; and

WHEREAS, in an action entitled "Gordon Form Lathe Company versus Walcott Machine Company", decided by the United States Circuit Court of Appeals for the Sixth Circuit on April 12, 1929, said patent as to certain of its claims was held valid and infringed by certain cam turning and crank shaft contour lathes heretofore manufactured and sold by the Walcott Machine Company of Jackson, Michigan; and

WHEREAS, Nash has heretofore purchased and used and is now using certain Lathes manufactured by the said Walcott Machine Company employing the construction referred to in the decision above described and now desires to free and release said Lathes for the future from any claim of infringement of said Letters Patent.

Now, Therefore, for and in consideration of One Dollar ($1.00) by each of the parties to the other in hand paid, receipt whereof is hereby acknowledged, and other valuable considerations, each of the parties to the other moving, the said parties have covenanted and agreed as follows:

First: Gordon hereby releases and frees from infringement of said Letters Patent of the United States No. 1,542,803, the hereinafter identified cam turning Lathes now in the possession of Nash, said release to take effect as of October 1, 1929 and to continue throughout the life of said Lathes; the Lathes so released being for use upon cam shafts for Six or more cylinder engines, and being identified as follows:

Nash Number	Maker's Serial Number
	124 (Milwaukee Plant)
	146 (" ")
	128 (Racine Plant)
	192 (" ")

Second: Gordon agrees that it will issue a similar license unto Nash for such other and further Lathes as Nash may acquire and request a license for upon payment by Nash to Gordon of the sum of Three Thousand Dollars ($3,000) for each such Lathe; provided, however, that if any such Lathe shall be intended for use upon shafts for less than six cylinder machines, the payment required shall be only Two Thousand Dollars ($2,000) per Lathe.

Third: In consideration of the foregoing release, Nash agrees to pay Gordon upon execution of this agreement the sum of Twelve Thousand Dollars ($12,000), such payment being at the rate of Three Thousand Dollars ($3,000) per Lathe.

FOURTH: It is distinctly understood and agreed that the release under clause FIRST hereof applies only to the use of said lathes subsequent to the effective date of said release, viz:—October 1, 1929; Gordon expressly reserving unto itself, its successors and assigns, any and all claims it now has or may hereafter acquire for or arising out or by reason of the claimed infringement of its said patent by Nash through the use of said lathes or any other infringing lathes at or during any time prior to October 1, 1929.

FIFTH: It is further agreed that in the event of litigation directed to a recovery for infringement of said patent No. 1,542,803, prior to October 1, 1929, neither party hereto shall in any wise use this agreement as affecting the measure of damages for such infringement.

SIXTH: It is further agreed that Gordon or its duly appointed representative or attorney shall have access to the manufacturing plants of Nash following the execution of this agreement, for the purpose of verifying the number of infringing lathes in use or in the possession of Nash and the identifying markings thereon as set forth under clause FIRST hereof.

SEVENTH: Gordon further agrees that it will not grant a similar license or release to any other person, firm or corporation for a sum of money less than that herein agreed upon per machine; it being understood and agreed that if this undertaking shall be violated, then Nash shall be entitled to a similar rate, both as to machines herein enumerated and as to any other machines which it may hereafter request license for.

EIGHTH: It is mutually understood and agreed by and between the parties that in the event said patent No. 1,542,803 shall be sold or otherwise disposed of to any person, firm or corporation for the benefit or in consid-

eration of money furnished by any group of automotive manufacturers, Nash shall be given an opportunity to join with said group of automotive manufacturers, and to apply any moneys paid to Gordon under the terms of this agreement toward the purchase price of said patent; it being understood, however, that in the event Nash shall elect to so join with such group of manufacturers and have said moneys applied to said purchase price, then the license and release herein granted shall be void and of no effect.

NINTH: This agreement shall be binding upon and inure to the benefit of the respective successors and assigns of the parties hereto.

Signed, sealed and delivered this first day of March, A. D. 1930.

GORDON FORM LATHE COMPANY
By CHAS. GORDON,
President.

(Corporate Seal)

THE NASH MOTORS COMPANY
By C. W. NASH,
President.

Attest:
H. J. MELLUM,
Secretary.

THIS AGREEMENT made this 30 day of October, 1930, by and between THE GORDON FORM LATHE COMPANY, a corporation of Ohio, having its principal place of business in Cleveland, Ohio, and GENERAL MOTORS CORPORATION, a corporation of Delaware, having a place of business at Detroit, Michigan, WITNESSETH That:

WHEREAS, The Gordon Form Lathe Company is the owner of inventions and Letters Patent (including United States Patent No. 1,542,803 on lathe granted to it June 16, 1925 as the assignee of Charles Gordon and Alfred W. Redlin) relating to the turning or finishing of regular or irregular shapes such as cams, crank cheeks and the like, and warrants that it has the right to make this agreement; and

WHEREAS, The Gordon Form Lathe Company has brought suits and threatened to bring suits against General Motors Corporation and others for infringement of said patent No. 1,542,803 and desires to effect a settlement of its claims against all such parties, and to convey to General Motors Corporation all its right under said patent and inventions with certain exceptions hereinafter defined;

THEREFORE, in consideration of the payment to it of one hundred ninety-five thousand dollars ($195,000.00) by General Motors Corporation, the receipt of which is acknowledged, The Gordon Form Lathe Company hereby

(1) Releases and agrees to release General Motors Corporation, a corporation of Delaware, its subsidiaries and nominees (with the specific and sole exception of Ford Motor Company) and its and their agents and customers and the users of its and their products from any and all liability and cause of action for which it and/or they might otherwise be accountable or subject by reason of the manufacture, use and/or sale, past, present and future, of the invention or inventions, machines, methods (and/or products thereof and articles made thereby) set

forth or disclosed in said patent and/or in any division, continuation or reissue thereof, and/or disclosed in any other United States patents and/or applications for patent and/or included in any invention now or hereafter owned or controlled by The Gordon Form Lathe Company which said patents or applications for patent or inventions relate in any way to the turning or forming of regular and/or irregular shapes; The Gordon Form Lathe Company also hereby grants the same parties a similar release with regard to any and all foreign patent rights which it may now have or hereafter obtain with respect to the said inventions or any of them.

(2) Grants General Motors Corporation the exclusive right and license, except as hereinafter indicated, to make, use and sell devices of every sort embodying and/or made by the several inventions or any of them, (and to practice the processes of the inventions) referred to heretofore in this instrument, with the exclusive right to sublicense any and all parties, except as hereinafter indicated. This license is for the world and shall run for the life of any and all patents involved, but it is expressly understood that all rights, past and future, heretofore held by The Gordon Form Lathe Company against the Ford Motor Company are specifically and solely reserved by The Gordon Form Lathe Company.

(3) Agrees to dismiss without prejudice the suit which it has brought against General Motors Corporation for infringement of patent No. 1,542,803, and agrees, upon demand of General Motors Corporation to dismiss without prejudice any suit or suits which it has heretofore brought against others for infringement of the said patent, each party in the event of such dismissal to bear its own costs.

(4) Assigns to General Motors Corporation, its subsidiaries, and/or its nominees the exclusive right to effect settlement and/or to bring suit at the expense of the as-

signees, based upon the patents, applications and inventions which are the subject matter of this license in its name against any and all infringers, past and future, (with the specific and sole exception of the Ford Motor Company) and/or persons, partnerships and corporations threatening to infringe, to obtain injunctions against such infringers and/or to collect damages or profits or royalty for such infringement.

(5) Agrees not to sell or assign any of the patents, applications or inventions which are the subject matter of this license to any one except to the group consisting of the General Motors Corporation, its subsidiaries and nominees.

(6) Agrees that it will maintain its corporate existence by payment of all taxes and other charges necessary so to do for the period of the life of any and all patents which are the subject matter of this license, or in the alternative that it will assign all the said patents, applications and inventions together with the right to collect for past infringement to the group consisting of the General Motors Corporation, its subsidiaries and nominees.

(7) Execute such additional instruments (and/or procure the execution by each and all other parties as may have an interest in the said inventions and/or patents and/or patent applications referred to above) as may be deemed necessary by General Motors Corporation, its subsidiaries and/or nominees to carry into effect the purposes of this settlement.

(8) General Motors Corporation on its part agrees to indemnify and hold harmless The Gordon Form Lathe Company against any and all claims and/or demands arising out or by virtue of contracts (copies attached hereto and made a part hereof) made by it with certain other parties, namely,

(a) J. I. Case Company agreement dated February 18, 1930,

(a') J. I. Case Company agreement dated February 18, 1930,

(b) The White Motor Company agreement dated February 6, 1930,

(b') The White Motor Company agreement dated December 21, 1929,

(c) The Nash Motors Company agreement dated March 1, 1930,

(d) Chrysler Corporation agreement dated July 17, 1929.

The Gordon Form Lathe Company hereby assigns to General Motors Corporation all its rights, past and future, under the aforesaid contracts with the J. I. Case Company, the White Motor Company, the Nash Motors Company and Chrysler Corporation; and warrants that it has not heretofore granted any license or release or effected any settlement under said patent No. 1,542,803 other than by way of the contracts enumerated in this section. Provided, however, that nothing herein shall affect the rights of The Gordon Form Lathe Company to retain all moneys heretofore collected by it under said contracts.

The Gordon Form Lathe Company warrants that it is the company which is a party to the agreements identified above in which it appears as Gordon Form Lathe Company.

(9) The Gordon Form Lathe Company expressly withholds from General Motors Corporation, its subsidiaries and/or nominees the right to sell or otherwise dispose of machines embodying the inventions of said patent to the Ford Motor Company and/or the right to grant a release for any such machines hitherto sold or otherwise disposed of to and/or used by the Ford Motor

Company and/or the right to grant a release for methods covered by said patent and hitherto used by the Ford Motor Company.

(10) The firm of Bottum, Hudnall, Lecher, McNamara and Michael of Milwaukee, Wisconsin, and the firm of Richey and Watts of Cleveland, Ohio, hereby consent to the foregoing agreement and said firms individually and jointly hereby assign and release to General Motors Corporation, its subsidiaries and nominees, all their rights and interest, past, present and future, in said Letters Patent No. 1,542,803 and any other letters patent, applications and/or inventions included within the foregoing agreement except their rights and interests with respect to the Ford Motor Company which they specifically reserve and retain.

The Gordon Form Lathe Company, Bottum, Hudnall, Lecher, McNamara and Michael and John W. Michael jointly, severally and personally warrant that The Gordon Form Lathe Company owns and controls the entire right, title and interest in, to and under said letters patent 1,542,803 except insofar as licenses have been granted to the concerns specified in section 8 (a) to (d) inclusive.

THE GORDON FORM LATHE COMPANY

By JOHN W. MICHAEL,
Attorney.

BOTTUM, HUDNALL, LECHER, McNAMARA AND MICHAEL

By JOHN W. MICHAEL,

RICHEY AND WATTS

By RICHEY & WATTS
FRANCIS O. RICHEY.

I, John W. Michael, warrant that I have full and complete power and authority to execute this agreement in the name of The Gordon Form Lathe Company and in the name of my firm, Bottum, Hudnall, Lecher, McNamara and Michael, and that there are no other parties except the firm of Richey and Watts and stockholders in The Gordon Form Lathe Company that have any interest in, or claim under, this settlement and that such stockholders have claims solely as stockholders of The Gordon Form Lathe Company.

JOHN W. MICHAEL.

I, Francis O. Richey, warrant that I have full and complete power and authority to execute this agreement in the name of my firm, Richey and Watts.

Witnesses
G. C. ARVEDSON,
L. M. SPENCER.

FRANCIS O. RICHEY.

Attest:
N. MERRILL,
Secretary.

GENERAL MOTORS CORPORATION
By O. S. HUNT.

L. M. SPENCER
JAS. MCEVOY

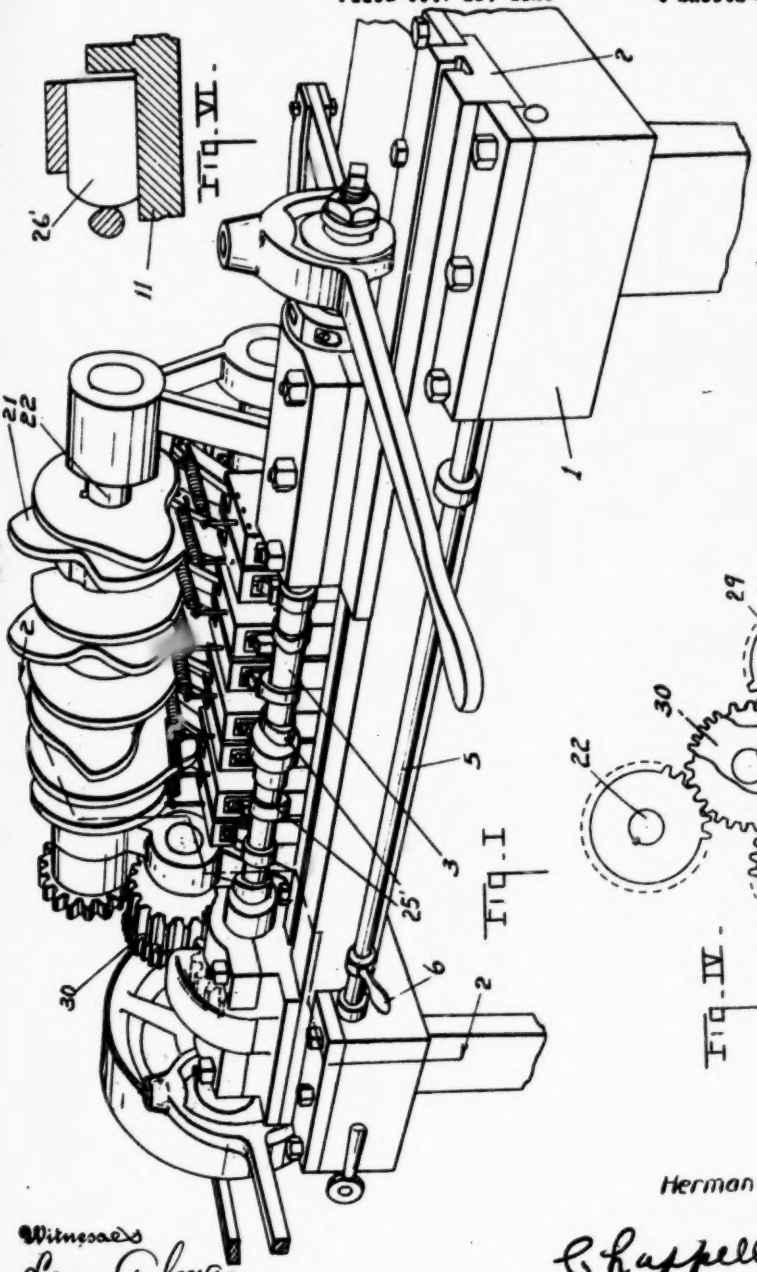
1558

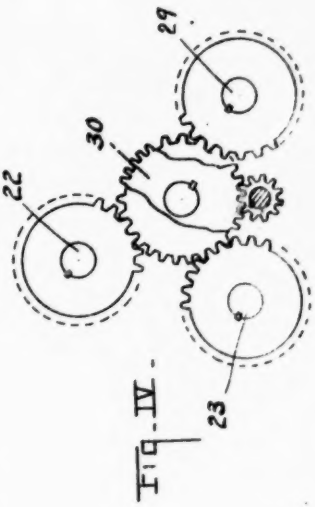
Jan. 10, 1928. 1,655,655

H. W. MELLING

LATHE

Filed Oct. 13, 1920 4 Sheets-Sheet 1





Inventor
Herman W. Melling

Witnesses
Leon Gilman
M. Louise Thurston

By Chappell & Earl
Attorneys

DEFENDANT'S EXHIBIT NO. 209

1558

DEFENDANT'S EXHIBIT NO. 209

1559

Jan. 10, 1928. 1,655,655

H. W. MELLING

LATHE

Filed Oct. 13, 1920 4 Sheets-Sheet 2

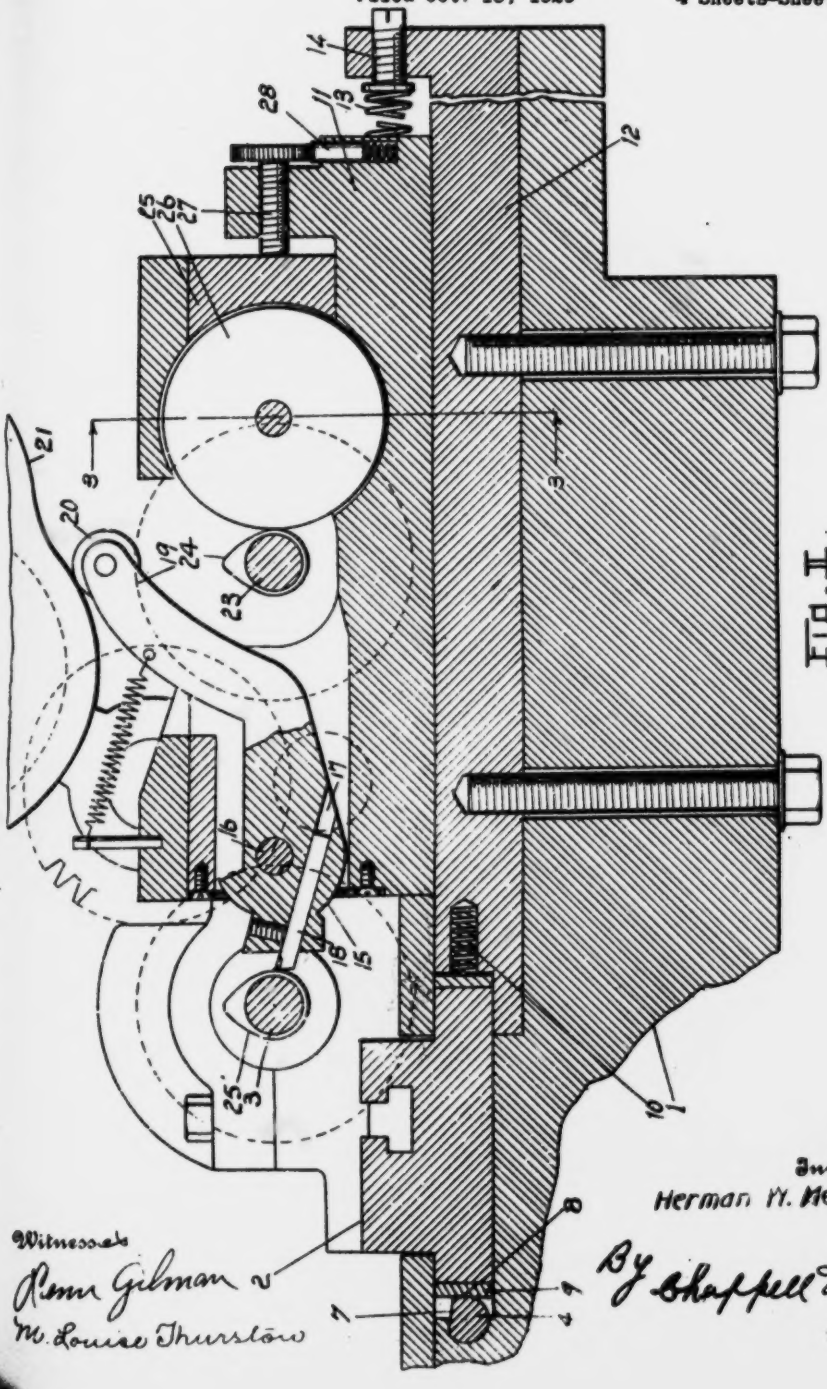


Fig. II.

Inventor
Herman W. Melling

Witnesses:
Rena Gilman
M. Louise Thurston

By Chappell & Earl
Attorneys

1550

Jan. 10, 1928.

1,655,655

H. W. MELLING

LATHE

Filed Oct. 13, 1920

4 Sheets-Sheet 3

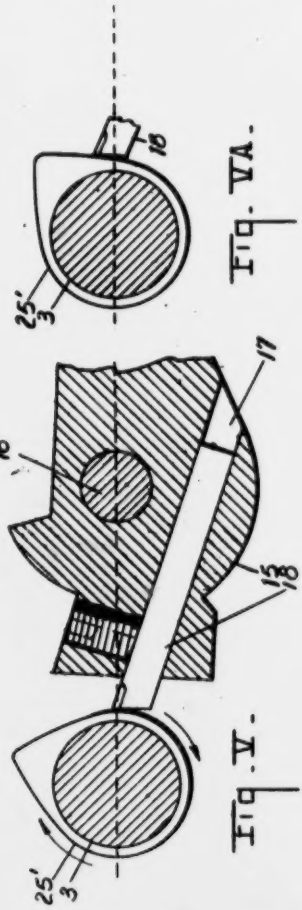


Fig. V A.

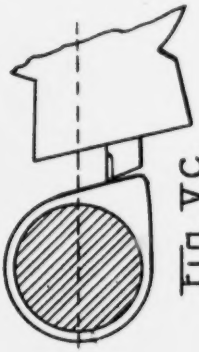


Fig. V C.

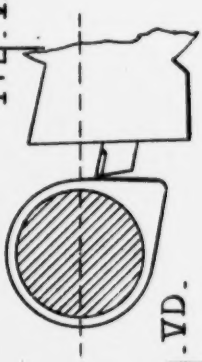


Fig. V D.

Fig. V.

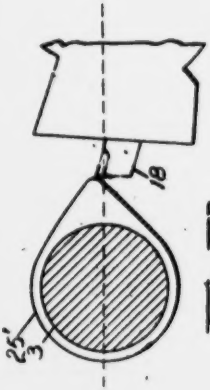


Fig. V B.

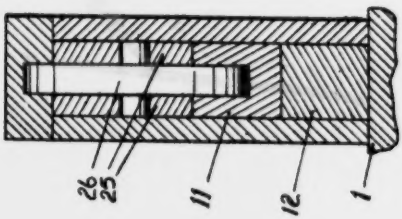


Fig. III.

Witnesses
Leon Gilman
M. Louise Thurston

Inventor
Herman W. Melling
By Chappell & Earl
Attorneys

Jan. 10, 1928. 1,655,655

H. W. MELLING

LATHE

Filed Oct. 13. 1920 4 Sheets-Sheet 4

Fig. VII.

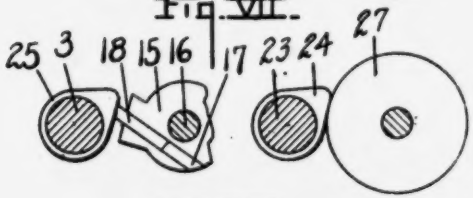


Fig. VIII.

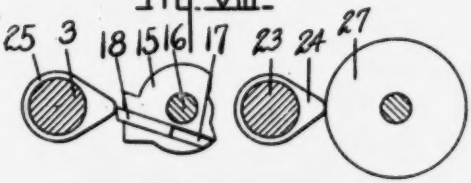


Fig. IX.

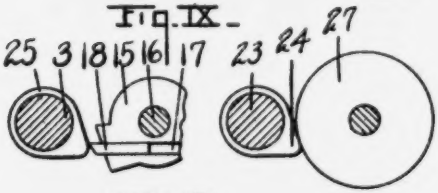


Fig. X.

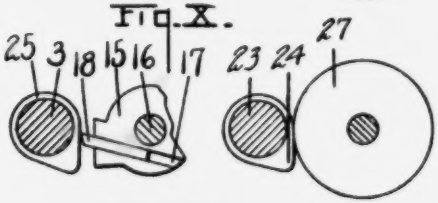


Fig. XI.

Inventor
Herman W. Melling

By Russell & Co

Attorneys

Patented Jan. 10, 1928. 1,655,655

UNITED STATES PATENT OFFICE.

HERMAN W. MELLING, OF JACKSON, MICHIGAN.

LATHE.

Application filed October 13, 1920. Serial No. 416,750.

This invention relates to improvements in lathes. The main objects of this invention are:

First, to provide an improved lathe for the manufacture of cam shafts.

Second, to provide an improved lathe for the manufacture of cam shafts by means of which cam shafts may be rapidly and accurately produced.

Third, to provide an improved lathe of the class described in which the cam shafts produced require but little finish grinding.

Fourth, to provide an improved cam forming machine in which the tool is automatically adjusted to maintain its proper relation to the work as the work is revolved.

Fifth, to provide an improved cam forming machine of large capacity.

Sixth, to provide an improved machine of the class described which is comparatively simple in its parts, very durable and not likely to get out of repair in use.

Further objects, and objects relating to structural details, will definitely appear from the detailed description to follow.

I accomplish the objects of my invention by the devices and means described in the following specification. The invention is clearly defined and pointed out in the claims.

A structure which is a preferred embodiment of my invention is clearly illustrated in the accompanying drawing forming a part of this specification, in which:

Fig. I is a front detail perspective view of a structure embodying features of my invention. Fig. II is a detail view, mainly in transverse vertical section on the line corresponding to line 2—2 of Fig. I, certain parts being shown in full lines for convenience in illustrating. Fig. III is a detail section on a line corresponding to line 3—3 of Fig. II. Fig. IV is a detail view of the driving connections for the work, and the pattern cam shaft and tool control shaft. Figs. V, V^A, V^B, V^C and V^D are enlarged detail views illustrating the relation of the tool to the work in several positions thereof.

Fig. VI is a detail section corresponding to Fig. II showing a modified form of carriage abutment or thrust member. Figs. VII, VIII, IX, X and XI are detail views illustrating the relative relation of the master cam to its abutment and the tool to the work in several positions thereof.

In the drawing similar reference characters refer to similar parts throughout the several views, and the sections are taken looking in the direction of the little arrows at the ends of the section lines.

Referring to the drawing the bed 1 is provided with a suitable way for the work carriage 2. The work carriage is provided with suitable chucks for the work 3 which in the structure illustrated is a valve cam shaft for an internal combustion engine. The structural details of the work carriage and its feed means and of the chucks are not illustrated as such details form no part of my present invention.

The work carriage is preferably supported for lateral adjustment to regulate the cut. (See Fig. II.) This adjustment is effected by means of the cams 4 upon rock shaft 5 extending across the front of the machine and provided with a hand piece 6. These cams have two faces 7 and 8 (See Fig. II) which coact with thrust plates 9 on the carriage. Springs 10 hold the carriage yieldingly forward. In operation the first cut is taken with the cam face 7 against the thrust plate, and the second or finishing cut is taken with the cam face 8 against the thrust plate which shifts the carriage laterally and holds it in position for the second cut without adjusting the tools.

For each cam to be cut on the cam shaft I provide a tool carriage 11 supported on a slide 12 for movement laterally of the work. The spring 13, the tension of which may be adjusted by means of the screw 14, holds or urges the tool carriage toward the work. The tool holder 15 is pivotally mounted at 16 and provided with a seat 17 for the tool 18. The tool holder is provided with an upwardly and rearwardly projecting arm 19 having a roller 20 travelling on the tool holder control cam 21. These cams 21 are mounted on shaft 22 disposed above the tool holder carriages, there being a control cam for each tool holder.

I provide a master or pattern cam shaft 23 having cams 24 thereon of the same shape as the cams 25' to be cut on the cam shaft 3. The cams 24 control the movement of the tool holder carriages 11, each carriage being provided with a thrust member 25 having thrust or abutment rollers 26 coacting with the cams 24. These thrust members are adjustably supported by means of the screws 27, detent 28 being provided for holding these screws in their adjusted positions.

The cam shafts 23 and the work spindle 29 are driven at the same speed by means of the driving gear 30. (See Fig. IV.) The master or pattern cams 24 which are replicas of the work control the movements of the tool carriages. It will be noted that the pivot axis of each tool on its holder is substantially spaced from its point so that the cutting edge of the tool swings in a substantial arc transversely to the travel of the tool carriage. This swinging of the tool on its pivot is an essential feature in reproducing the pattern or master cam. The cam 21 acting on the tool holder maintains the tool 18 in its proper relation to the work as the carriage is reciprocated and as the work revolves. This travel or swinging movement of the tool holder is illustrated in Figures V to V^{D} inclusive, and also in the Figures VII to X inclusive. To secure this result most efficiently, it is desirable that the radius of the thrust roller 26 should correspond to the radius of the tool. The tool is oscillated on its axis so that the point of engagement of its cutting edge with the work corresponds to the point of engagement of the master cam with its abutment.

It is understood that in order for tools of this type to cut most effectively, the tools must be presented to the work at approximately a proper cutting angle, and this results from the control or actuation of the carriage and tool as described.

In the preferred embodiment illustrated I provide the thrust rollers 26. In the modification illustrated in Fig. VI the thrust members 26' having curved surfaces corresponding to that of rollers are provided. The rollers, however, have the advantage of reducing friction and wear.

With the parts thus arranged I provide a structure by means of which cam shafts may be rapidly and accurately manufactured with a minimum of attention on the part of the operator.

The tools being properly presented to the work at all times the work comes from the machine in a manner requiring very little finish grinding. By the adjustment of the work carriage laterally a rough cut may be taken and the work carriage adjusted for a finish cut which is a further advantage in producing a substantially finished product.

Another advantage that the construction has is that the pattern cams are exact duplicates of the cams to be cut enabling the use of stock cams as patterns, and the tool holder control cams may be laid out by adjusting the tool holder to the various positions in which it would lie in relation to the work as illustrated in Figs. V to V^{D} inclusive.

It will be observed that the axes of the work, tool holder, the master cam and its abutment are in the same plane and in a plane parallel with the path of movement of the tool carriage. The radius of the abutment surface and the radius of the arc of the cutting edge of the tool are substantially the same. The tool holder is oscillated by means of its control cam so that the cutting edge of the tool with the work and the point of contact of the abutment with the master cam maintains the same relative relation, which results in the work being an exact duplicate of the master cam and also in maintaining the proper angle of the cutter relative to the work.

I have illustrated and described my improvements in an embodiment designed for the cutting of valve cam shafts in which all of the cams are of the same shape.

While my improvements are well adapted for a plurality of cams simultaneously they are also adapted for cutting single cams.

I have not attempted to illustrate or describe the various modifications and adaptations which I contemplate as I believe the disclosures made will enable those skilled in the arts to which my invention relates to embody or adapt same as may be desired.

Having thus described my invention which I claim as new and desire to secure by Letters Patent is:

1. In a cam shaft cutter, the combination of a work carriage, a plurality of tool carriages movable laterally of said work carriage, tool holders pivotally mounted on said tool carriages and provided with upwardly and rearwardly projecting arms, tools on said tool holders, a shaft provided with a plurality of master cams corresponding in shape to the work to be cut, springs urging said tool carriages toward the work, thrust members adjustably mounted on said tool carriages and provided with rollers coacting with said master cams, the radius of said rollers corresponding to the radius of the paths of the cutting edges of the tools, a cam shaft provided with plurality of tool control cams cooperating with said tool holder arms to swing the tool holders on their pivots for maintaining the position of the tools relative to the work as the work revolves, and means for driving the work and said master and tool control cams in synchronism.

2. In a cam shaft cutter, the combination of a work carriage, a plurality of tool carriages movable laterally of said work

riage, tool holders pivotally mounted on said tool carriages, tools on said tool holders, a shaft provided with a plurality of master cams corresponding in shape to the work to be cut, springs urging said tool carriages toward the work, thrust members on said tool carriages provided with abutment members having curved surfaces coacting with said cams, the radius of said abutment members corresponding to the radius of the paths of the cutting edges of the tools, a cam shaft provided with plurality of tool control cams cooperating with said tool holders to swing the tool holders on their pivots for maintaining the position of the tools relative to the work as the work revolves, and means for driving the work and said master and tool control cams in synchronism.

3. In a structure of the class described, the combination of a tool carriage, a tool holder pivotally mounted on said tool carriage, a tool on said tool holder, the axis of the tool pivot being substantially spaced from the point of the tool, so that the point of the tool swings in a substantial arc, a tool carriage control cam, which is a replica of the work to be cut, and a tool control cam cooperating with said tool holder for maintaining the position of the tool relative to the work as the work revolves.

4. In a cam shaft cutter, the combination of a work carriage, a tool carriage movable laterally of said work carriage, a tool holder pivotally mounted on said tool carriage, a cutter carried by said tool holder, a master cam corresponding in shape to the work to be cut, a thrust member on said tool carriage provided with a roller coacting with said master cam, the radius of said roller corresponding to the radius of the path of the cutting edge of the tool, and a tool control cam cooperating with said tool holder to swing the tool holder on its pivot for maintaining the position of the cutter relative to the work as the work revolves, the means for driving the work and said master and tool control cams in synchronism.

5. In a cam shaft cutter, the combination of a work carriage mounted for lateral adjustment for determining the depth of cut, a tool carriage movable laterally of said work carriage, a tool holder pivotally mounted on said tool carriage, a tool carried by said tool holder, a tool carriage control cam corresponding in shape to the work to be cut, and a tool control cam for said tool holder.

6. In a structure of the class described, the combination of a work holder, a tool carriage provided with an abutment, a master cam for controlling said carriage coacting with said abutment, a tool holder on said carriage movable in a plane transverse to the path of travel of the carriage, and means actuating said tool holder timed with the actuation of said carriage, so that the path of travel described by the point of the tool is a replica of that at the point of contact of the master cam and abutment.

7. In a structure of the class described, the combination of a rotary work holder, a tool carriage movable to and from the work in a plane transverse to the axis of the work, a tool holder mounted on said carriage, on a relatively fixed axis substantially spaced from the point of the tool and so that the tool swings in a plane transverse to the travel of the carriage, and means for actuating said carriage and oscillating said tool timed with the rotation of the work.

8. In a structure of the class described, the combination of a tool carriage, a tool mounted on said carriage for swinging movement on a relatively fixed pivot the axis of which is spaced from the point of the tool whereby the point of the tool swings in an arc transverse to the travel of the carriage, a pattern cam which is a replica in shape of the work to be cut for controlling said carriage, and means for swinging said tool whereby its cutting position relative to the work is maintained as the work revolves.

9. In a structure of the class described, the combination of a work carriage, a tool carriage reciprocating laterally of said work carriage, a tool holder pivotally mounted on said tool carriage, the pivot of the tool being substantially spaced from the point of the tool, a master cam which is a replica of the work to be cut for reciprocating said tool carriage, the axes of said master cam and tool holder being in the same plane, and a tool control cam for said tool holder whereby the position of the tool relative to the work is maintained as the work revolves.

10. In a structure of the class described, the combination of a work carriage, means for rotatably supporting the work on said work carriage, a tool carriage reciprocating laterally of said work carriage, a tool holder pivotally mounted on said work carriage, a tool carried thereby, a master cam corresponding to the shape of the work to be cut, an abutment roller coacting with said cam to reciprocate said carriage, the radius of the arc described by the cutting edge of the tool and that of the abutment roller being substantially the same, the axes of the work, tool holder, master cam and abutment roller being in the same plane, such plane being parallel to the plane of the path of the carriage, a cam for oscillating said tool holder on its pivot so that the cutting edge of the tool and the point of contact of the master cam and abutment roller are in the same plane which moves across the plane of said axes, and means for driving the work and the master cam at the same speed.

11. In a structure of the class described, the combination of a work carriage, means

1597

Purchase Order No. D 59795

Date 1/20/24

DELIVERY REQUIRED AT OUR PLANT

[illegible] Lathe Co
[illegible]son Mich

named party agrees to manufacture, sell and deliver materials specified below, subject to the terms and conditions stipulated:

SHIP VIA [illegible]ectric rt. from Jackson — 1 day from date of order

TERMS 2% 20th Prox. Net 60 days

F.O.B Gen'l Jackson Mich

QUANTITY	DESCRIPTION OF MATERIAL	PRICE
1 only	Welling cam turning lathe; with regular equipment and tooled to turn cams on T-410 camshaft; guaranteed to satisfactorily produce 45 camshafts per hour and to be placed in our plant on 60 days trial. Headstock spindle to have hand operated chuck. Hardened Master camshaft to be supplied by us. Arranged for chain motor drive, you to supply chain, sprockets and guard, we to supply motor only, you to mount same to machine.	
	each	$4150.00

2 L. 2/7
2K 1/19/24
[illegible]

For operating above:

1 5 HP, 1150 R.P.M. Westinghouse motor, type SK, frame 38, 220 volts, DC without pulley, slide rails or starter.
Dia. sheet attached

Direct to Jackson from Westinghouse on order D59796

Mark & Consign: MICHIGAN PLANT
Ford Motor Co
(for order D 59795)
Detroit Mich

ZAE E
716618
Acct 180-101
(ZWE) Purpose: T-410 camshaft, oper. 44, shape cams.

INVOICE AND RECEIVING RECORD							FOLLOW UP RECORD	
Material in Transit	Invoice Date	Amount Invoiced	Date Received	Receiving Slip Number	Amount Received	Total Received	Date	Remarks
							2/14	Old motor sent from Pitts 2/1. Advise delivery
							2/2	2/4 11:00 A.M. P 3/60 cy. 2/26 if motor arrives in time
		Rec'd N.O. 2/24/24					2/27	Mr Sleight 2/28 Cleveland truck
		Inv 35472						
		Rec'd 16 Finished Camshafts				3/6/24		
		15 Rough						
24								
		1						
								Purchase Order No. D 59795

DEFENDANT'S EXHIBIT NO. 217

1558

FORD FORM 3765

Ford Motor Company

HIGHLAND PARK, MICH.

(2nd COPY)
PRODUCTION DEPT.
FOLLOW-UP
ROUGE PLANT

This Order Number must appear on all Packing Slips, Bills of Lading, Machines, Packages and Invoices

The FORD MOTOR COMPANY, of Highland Park, Michigan, first party, hereby agrees to purchase and receive at its Rouge Plant, and

Purchase Order No. B 13605 .

Date 1-17-24

DELIVERY REQUIRED
1-20-24

Gulsett Lathe Company
Jackson, Mich.

second party agrees to manufacture, sell and deliver materials specified below, subject to the terms and conditions stipulated:

SHIP VIA Elec. Frt. from Jackson

TERMS 2% 20th prox. net 60 days

F. O. B. Cars Jackson, Mich.

QUANTITY	DESCRIPTION OF MATERIAL	PRICE
1 only 218 Ord. 1/19/24 Ford	Melling regular cam turning lathe, with regular equipment and tooled to turn cams on F-446 Fordson camshaft, guaranteed production 80 camshafts per hour; headstock spindle to have hand operated chuck; hardened master cam shaft to be supplied by us; arranged for chain motor drive, we to supply motor only, you to supply chain, sprockets and guards, and mount motor to machine. For operating above: One 5-HP 1150 R/M General Elec. Motor, type RC, Frame 27A, 230 volts DC, without pulley, slide rails or starter. Dimension sheet attached. Direct to Jackson from General Elec. Co. on Order B-13617. Mark and consign: ROUGE PLANT Ford Motor Company (for Order B-13605) Detroit, Mich. Turning cams on Fordson camshaft F-446 SAE Fe (AHH) 16440 Acct. 180-102 FS B-745H1	on. $4180.00

ROUGE PLANT

INVOICE AND RECEIVING RECORD

Material in Transit	Invoice Date	Amount Invoiced	Date Received	Receiving Slip Number	Amount Received	Total Received
	Rec'd 1/31/24			B.P. 3061		
	Also rec'd 5 HP Gen. Elec. 917					
	Coiling 1/31/24			2256		
				Rec'd 19747		
H						

FOLLOW UP RECORD

Date	Remarks
2/7	Ord. 3d. 1-20-24
	Purchase Order No. B. 13605 .

DEFENDANT'S EXHIBIT NO. 218

1559

FORD FORM — Company — (2nd COPY) FOLLOW-UP

HIGH... — PARK, MICH.

This Order Number must appear on all Packing Slips, Bills of Lading, Machines, Packages and Invoices.

The FORD MOTOR COMPANY, of Highland Park, Michigan, first party, hereby agrees to purchase and receive, and

Purchase Order No. D 65520

Walcott Lathe Co
Jackson Mich

Date 4-1-24
DELIVERY REQUIRED AT OUR PLANT
1924
3 April 1/3 3 per week thereafter.

...ond party agrees to manufacture, sell and deliver materials specified below, subject to the terms and conditions stipulated:

SHIP VIA Electric/From Jackson Mich
Freight
TERMS 2% 20th prox Net 60 days
F. O. B. Our Highland Park Plant.

Any amounts shipped in excess of the quantity specified will not be accepted.

QUANTITY	DESCRIPTION OF MATERIAL	PRICE
Fifteen (15)	Walling Cam Turning Lathe; with regular equipment and tooled to turn cams on T-410 Camshaft; guaranteed to satisfactorily produce 45 Camshafts per hour and to be placed in our Plant on 60 days trial. Head stock spindle to have hand operated chuck. Hardened Master Camshaft to be supplied by us. Arranged for chain motor drive, you to supply chain, sprockets and guard, we to supply motor and mount same to machine.	$6000.00
Eql. 2 19 1/19/39 Scrap	For operating above: Westinghouse (15) 5 HP, 1180 RPM Westinghouse Motor, type SK, frame 2S, 220 volts DC, without pulley, slide rails or starter. Dimension sheet submitted.	
MAR'ENW 19260 180-101 (ANW)	5/a 3h - Last @ machines lever mechanism for operating head & tailstock collets	
Motors reserved in H. P. Stock MAR from 3-31-24	Mark and consign: HIGHLAND PARK PLANT Ford Motor Co (For order D-65520) Detroit Mich	
	T-410 Camshaft oper 12 Shape Cams.	

INVOICE AND RECEIVING RECORD

Material Received	Invoice Date	Amount Invoiced	Date Received	Receiving Slip Number	Amount Received	Total Received
1	Rec'd HP 4/4/24 -			BP 36386		
1	"	"	4/9/24	BP 36452		
1	"	"	4/10/24	BP 36496		
1	"	"	4/15/24	BP 36552		
1	"	"	4/19/24	BP 36597		
1	"	"	4/19/24	BP 36648		
			4/24			
			4/24			
			4/24			
			4/24			
			4/24			
			4/24			
1	Rec'd HP 5/10 -					

FOLLOW UP RECORD

Date	Remarks
4/...	① Tomorrow
	Bal ② each 3 days
4/...	Urgent
4/19	Mr. ... today - Tenant
	3rd Wednesday 4/19
	Wed. Today or Sat
	Bal at same rate
5/3	H-
5/6	H ② per wk until finished
5/13	Urgent
5/14	Mr. ... 15" " " " 4/29
	Purchase Order No. D 65520

DEFENDANT'S EXHIBIT NO. 219

1571

The FORD MOTOR COMPANY, of Highland Park, ... hereby agrees to purchase and receive at its Rouge Plant, and

Purchase Order No. B 19996

Date 4-24-24

DELIVERY REQUIRED

5-6-24

Bullock Lathe Company

Jackson, Mich.

second party agrees to manufacture, sell and deliver materials specified below, subject to the terms and conditions stipulated:

any amount shipped in excess of the quantity specified will not be accepted.

SHIP VIA Elec. frt. from Jackson

TERMS 2% 20th prox. Net 60 days

F. O. B. our Rouge Plant

QUANTITY	DESCRIPTION OF MATERIAL	PRICE
1 only	Milling Cam Turning Lathe; with regular equipment and toolen to turn cams on F-446, Tractor Camshaft. guaranteed to satisfactorily produce 30 camshafts per hour and to be placed in our plant on 60 days trial. Headstock spindle to have hand operated chuck; hardened master camshaft to be supplied by us; arranged for chain motor drive, you to supply chain, sprockets and guard, we to supply motor and mount same to machine.	each $4000.00

Eq. No. 220
1/19/29
Inst.

MOTOR FOR OPERATING:

One 5-H.P. Westinghouse Motor, 1150 R.P.M., Frame 22, Type SK, 220 volts, 60, without pulley, slide rails and starter. Dimension sheet attached.

Confirming order.

Mark and consign: ROUGE PLANT
Ford Motor Company
(for Order B-19996)
Detroit, Mich.

AAR: FW
17414
180-102
FB 3-11486
(AAR)

Motor reserved at Rouge Plant A.M. Jom. 4-19-24

Rough turn F-446, Tractor Camshaft

ROUGE PL

INVOICE AND RECEIVING RECORD								FOLLOW UP RECORD	
	Material in Transit	Invoice Date	Amount Invoiced	Date Received	Receiving Slip Number	Amount Received	Total Received	Date	Remarks
									May 1.
			Rec'd R 5/29/24					5/1	OK
								5/6	M Last of the month unless Cut-in on No order
			P.O. 37001					5/12	This will follow order 40330. the last mat which will ship 5/29
			OK 5/9 - 72					5/14	Ohare
								5/15	M. tomorrow by truck
									Purchase Order No. B 19996

DEFENDANT'S EXHIBIT NO. 220

The FORD MOTOR COMPANY, of Fordson, Michigan, first party, hereby agrees to purchase and receive, and

WALDOTT MACHINE CO
3-136 GENERAL MOTORS BLDG
DETROIT MICH

DATE OF ORDER 1-2-29
DELIVERY REQUIRED AT OUR PLANT
1 EACH 12-27-28
1-5-29

SHIP TO FORD MOTOR COMPANY

F. O. B. OUR PLANT
TERMS 2% 30TH PROX
ROUTING 1 TRUCK FROM JACKSON MICH

QUANTITY	DESCRIPTION OF MATERIAL	PRICE
2 ONLY	LATHE, MILLING CAM TURNING [illegible] REGULAR EQUIPMENT TO TURN CAMS ON A-[illegible] CAMSHAFT; WITH HARDENED AND GROUND STEEL TOOL HEADS; HEADSTOCK SPINDLE WITH HAND OPERATED CHUCK; HARDENED MASTER CAMSHAFT SUPPLIED BY US; ARRANGED FOR CHAIN MOTOR DRIVE, YOU TO SUPPLY CHAIN, SPROCKETS AND GUARD, WE TO SUPPLY MOTOR, YOU TO MOUNT TO MACHINE.	EA $9950.00
	FOR OPERATING ABOVE:	
	(2) 5 HP, 1150 RPM WAGE MOTORS, FORD FRAME D-15, TYPE SK, FRAME 32, 220 VOLTS-60, WITHOUT PULLEY, SLIDE RAILS OR STARTER.	
	[illegible] WILL BE SHIPPED TO JACKSON ON WAGE ORDER [illegible]	
	STARTER RECEIVED 2AR ORDER 12-28-28	

Exh. 221
1/9/33

SHIPPING AND RECEIVING RECORD — FOLLOW-UP RECORD

							Date	Remarks

DEFENDANT'S EXHIBIT NO. 221

The FORD MOTOR COMPANY, of Fordson, Michigan, first party, hereby agrees to purchase and receive, and

WALCOTT MACHINE CO
2-1250 GENERAL MOTORS BLDG
DETROIT MICH

DATE OF ORDER 1-22-29

DELIVERY REQUIRED AT OUR PLANT
1 EACH DAY 1-29-29, 2-5-29
2-12-29, 2-17-29

SHIP TO FORD MOTOR COMPANY

F. O. B. OUR PLANT

TERMS 2% 20TH PROX

ROUTING M.C. TRUCK FROM JACKSON MICH.

QUANTITY	DESCRIPTION OF MATERIAL	PRICE
FOUR (4) ONLY	SEMI-AUTOMATIC CAM TURNING LATHE; REGULAR EQUIPMENT TO TURN CAMS ON A CAM, CAMSHAFT; WITH HARDENED AND GROUND STEEL TOOL BLOCK; HORIZONTAL SPINDLE WITH HAND OPERATED CHUCK; PURCHASED MOTOR CAMSHAFT SUPPLIED BY US; ARRANGED FOR 60~ 3 PHASE MOTOR DRIVE, YOU TO SUPPLY CHAIN, SPROCKETS, AND GUARD, WE TO SUPPLY MOTOR, YOU TO MOUNT TO MACHINE.	EA $5250.00

FOR OPERATIONS ABOVE:

(1) 1 HP 1150 RPM SQUIRREL CAGE MOTOR FORD FRAME D 15 TYPE SK FRAME 25 220 VOLTS 3 Ø WITHOUT PULLEY BLOCK [illegible] 60 CYCLE 3 Ø STARTER D36 SHEET ATT. NET

NOTE: WE TO SUPPLY, NO CHARGE, BE GUARANTEE, A GOOD PULLEY AND MOTOR FOR WEIGHT OF ABOVE, TO BE RETURNED TO US NO CHARGE WITH MACHINE ON THIS WEIGHT 2250#

1-8-29

1-18-29

Exp 4110

WALCOTT MACHINE MOTOR BLDG

4 CAMSHAFT 3RD OPN TURNING CAMS GRD'S ON ARBOR

INVOICE AND RECEIVING RECORD

1		9/26/29	-	18.53	190#		1/12	
"		9/20/29	-	"	5 7745	(1)	1/24	
"		3/29	—	"	5 7960		1/27	
"		4/9	—		5 5778			
Motor + Cl Steps (12) to come back							3/12	
							3/24	
							3/26	
							3/28	

Purchase Order Pl...

Ø 4/12 Pl...

DEFENDANT'S EXHIBIT NO. 222

1931.
#232
193
11-23-39

THE WHITE MOTOR COMPANY

DEPARTMENTAL CORRESPONDENCE

December 17, 1931.

SUBJECT:

Mr. T. R. Dahl
1211F.

Dear Sir:

Please find herewith a Release and Sub-License under the Gordon and Redlin patent No. 1,542,803.

Yours very truly,

R. M. Cooper
Patent Engineer

RMC:hb
Enc.

check for $3,705.97 received 12/7/31 from Gen'l. Def. Motors Corp. representing def. for sales $6,055.97 which we pd. to Gordon for a release under patent no. 1,542,803 & the amt. which we were required to contribute as a member of a group of companies who pd. the above

White Roll Call and 100,000 mile records are made by GOOD WORKMANSHIP

DEFENDANT'S EXHIBIT NO. 232

THE WHITE MOTOR COMPANY

DEPARTMENTAL CORRESPONDENCE

RECEIVED
G. [illegible]
JAN 30 1930

January 29, 1930.

REF. _____

ANS. _____

SUBJECT:

JAN 31 1930

JAN 31 1930

Mr. G. V. Crilly
Comptroller.

Dear Sir:

Please forward the writer a check for Six Thousand Four Hundred Fifty-five Dollars and Ninety-two cents ($6,455.92) made payable to the Gordon Form Lathe Company.

This check will be forwarded to the Gordon Form Lathe Company in consideration of the release of our two lathes Nos. 2[illegible] and 1[illegible]2 from future infringement of United States Patent 1,542,[illegible], and in consideration of the release of The White Motor Company from any and all claims for past infringement of such patent.

Yours very truly,

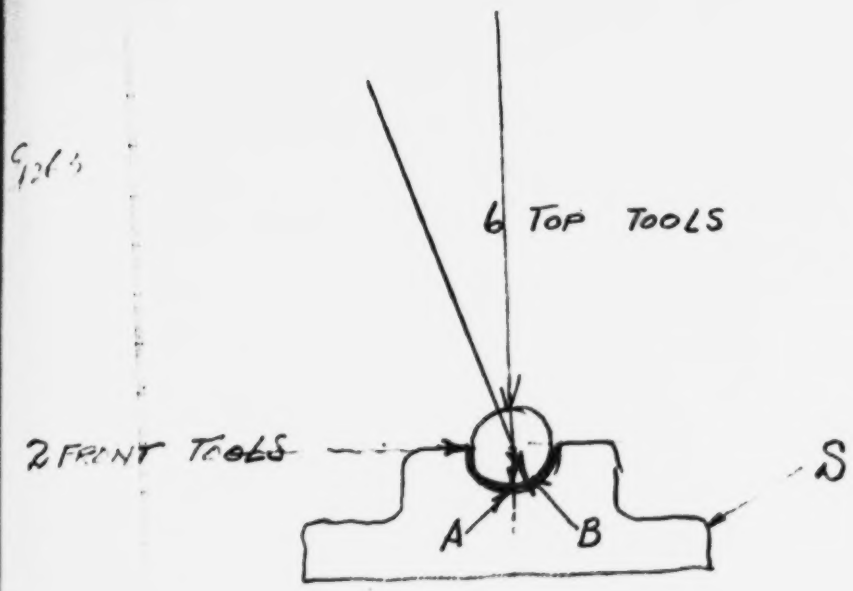
R.M. Cooper

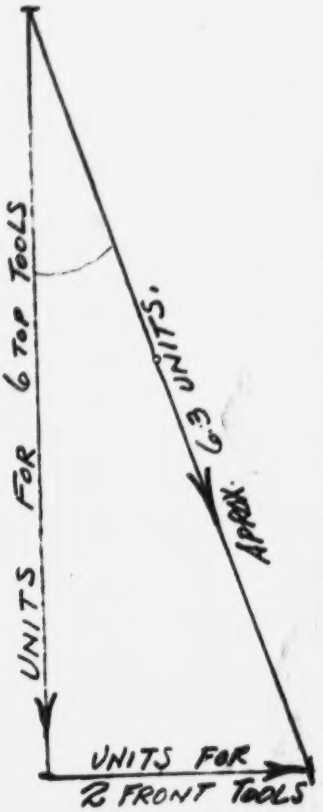
R. M. Cooper
Patent Engineer.

1-31-30

Mile Roll Call and 100,000 mile records are made by GOOD WORKMANSHIP

DEFENDANT'S EXHIBIT NO. 233


6 TOP TOOLS
2 FRONT TOOLS
S
A
B


UNITS FOR 6 TOP TOOLS
APPROX. 6.3 UNITS
UNITS FOR
2 FRONT TOOLS

Ex. 264
m

Ford Motor Company

NOV 3 1938 MCB

FACTORY AND GENERAL OFFICES
3874 SCHAEFER ROAD
DEARBORN, MICH.

November 2, 1938

Bodman, Longley, Bogle, Middleton, & Farley
1400 Buhl Building
Detroit, Michigan

Att: Mr. Farley

Dear Sirs:

Per your request, we are giving below data of speeds and feeds on the Camshaft Shaper, based on information from you of 700 R.P.M. for Driving Pulley:

Driving Pulley runs @ 700 R.P.M.
Driven Gear = 13" Pitch Diameter
Driving Gear = 4-1/6" Pitch Diameter

Speed of Crank = $\frac{700 \times 4\text{-}1/6}{13}$ = 220 R.P.M.,
or 220 strokes per minute of slide.
Feed per stroke = 1/32.

Circumference of Model "T" Cam = approx. 2.9" ✓
1/32 feed per stroke gives $\frac{2.9}{1/32}$ = 92.8,
or 93 strokes for total rotation of cam.
Total cutting time per shaft = $\frac{60 \times 92.8}{220}$ = 25.3 seconds. 50.

Circumference of Model "A" Cam = approx. 3.3" ✓
1/32 feed per stroke gives $\frac{33}{1/32}$ = 105.6,
or 106 strokes for total rotation of cam.
Total cutting time for cam = $\frac{60 \times 106}{220}$ = 29 seconds.

Surface speed of tool:
220 strokes per minute
Cutting stroke 240°, Return stroke 120°, of revolution
Distance of stroke = 1-1/4"
Surface speed of tool = $\frac{220 \times 1\frac{1}{4} \times 3}{2 \times 12}$ = 34 ft. per min. average.

Very truly yours
FORD MOTOR COMPANY

WM F PIOCH
Mechanical Design Dept.

WFP:NB:JEK

DEFENDANT'S EXHIBIT NO. 264

$\frac{1}{4} \times \frac{3}{2} = .375$

$2 \frac{3}{2} = 3.000$
$.375$
1.625

$.75 \times$ ~~1/4~~ "use on length & bearing

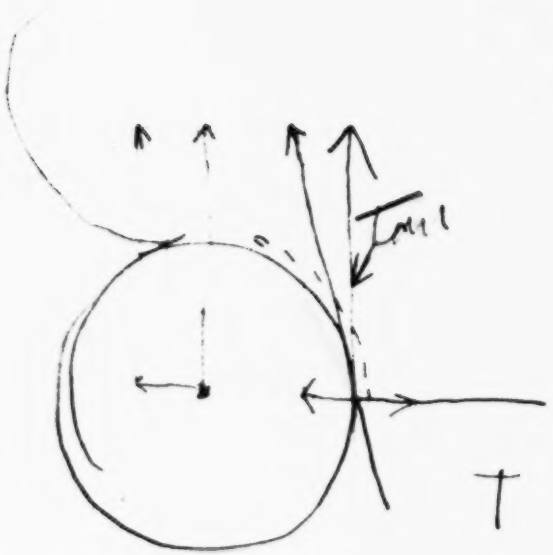
$175x = 3$

$x = .75$ 3.000 1.714
175
1250
1225
250
175
750
700

$\frac{3}{4} \times 2.66$

1/2 8/5 9.

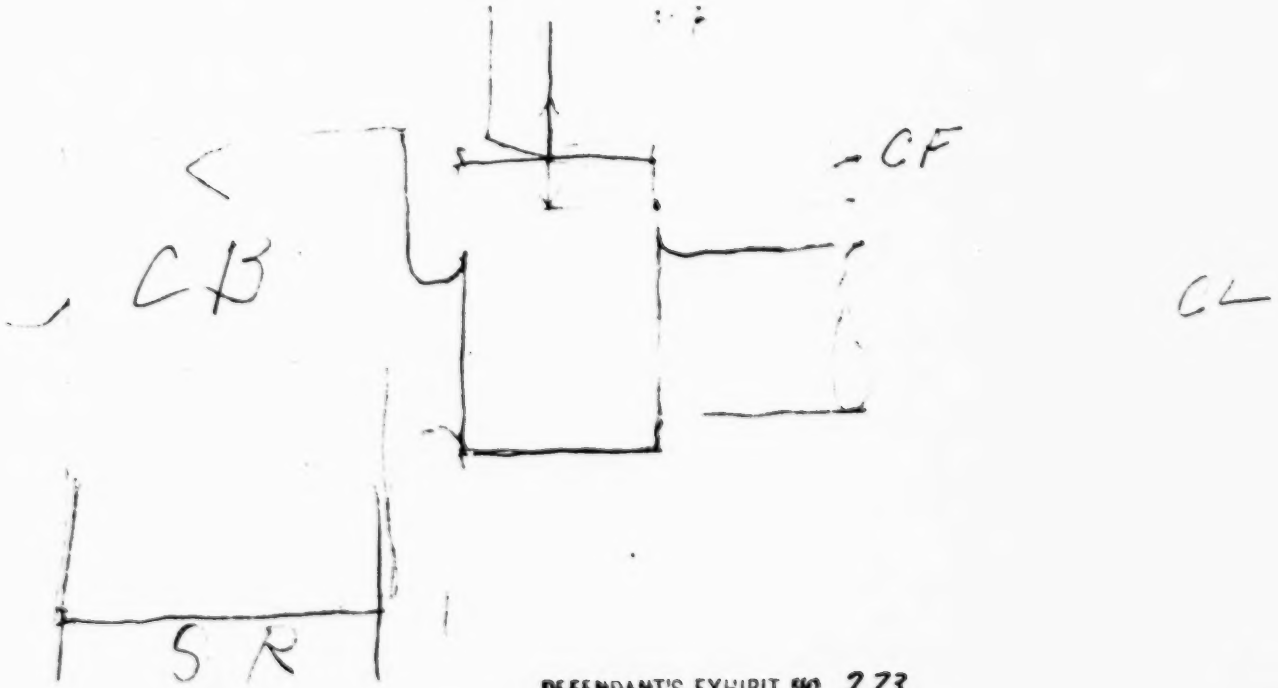
Sent



272
FB
1/30/39

1586

DEFENDANT'S EXHIBIT NO. 272



DEFENDANT'S EXHIBIT NO. 273

DEFENDANT'S EXHIBIT NO. 276

Exh. 281.
11/31/39.

CAM SHAFT

(One used in T-5949 Assy.)

DEPT — T-410

4210	1.	Cut to length	.2400	
	2.	Heat and upset collar	.9600	
	3.	Heat and Forge (Hammer)	.8000	
	4.	Trim	.4000	
13	5.	Anneal		
	6.	Tumble		
410	7.	Center both ends	.286	
	8.	Rough Straighten	.614	
	9.	Rough turn center bearing	.578	
	10.	Turn between cams	.578	
	11.	Straddle face flange and nick center front bearing and stamp "FORD"	.614	
	12.	Rough turn gear post and nick center bearing	.571	
	13.	Drill letter "L" hole in flange	.286	
	14.	Rough turn two end bearings	.534	
	15.	Straighten	.571	
	16.	Rough grind center bearing	.357	
	17.	Turn cam lathe	.510	
	18.	Heat and quench in straightening Machine	.700	
	19.	Polish one cam for selerscope	.180	
	20.	Second re-straighten	.178	
	21.	Grind recess at end of front bearing	.318	
	22.	Finish grind center bearing	.583	
	23.	Rough grind inside flange	.583	
	24.	Finish grind front bearings	.927	
	25.	Finish grind rear bearings	1.080	
	26.	Inspect for line bearing (Dept. 410)	.32	
	27.	Facing flange and cut gear post and comm. post to length.	.616	
	28.	Finish turn gear post comm. post and Chamfer	.616	
	29.	Drill letter "H" holes. .302" in flange and ream two 5/16" holes in flange	.361	
	30.	Inspect dowel pin holes (Dept. 410)	.63	
	31.	Burr two 5/16" holes in flange	.143	
	32.	Drill one 1/8" hole in comm. post	.208	
	33.	Burr one 1/8" hole in comm. post and burr one hole in face of flange	.143	
	34.	Burr inside of "H" hole	.143	
	35.	Grind burr from flange and chamfer commutator post	.238	
	36.	Threading 9/16" -18 thread on commutator post	.168	
	37.	Thread 13/16 thread on gear post	.238	
	38.	Finish grind cams	2.969	
	39.	Time	1.955	
	40.	Chamfer #1 Cam	.168	
	41.	Remove burrs from cams	.143	
	42.	Straighten center bearing	.178	

DEFENDANT'S EXHIBIT NO. 281

T-410

43.	Finish straighten	.178
44.	Finish grind outside face of flange	.238
45.	Re-grind front recess	.180
46.	Re-grind center bearing in Assy.	
47.	Polish Minor Cam	.275
48.	Wash	.143
49.	Polish all bearings	.238
50.	Hand on conveyor	.119
		23.051

NOTE: Operations #1 to 6 Incl. Added.

When making any changes notify Prod. Dept. 4371.

Written 12-21-25.
Revised 3-22-26
Revised 11-10-26
Revised 12-21-27
Revised 12-21-27

EF-cm

Card #1.

RECORD OF CHANGES

NAME OF PART Cam Shaft.

[illegible] position between the exhaust and inlet cam was [illegible] – this has been changed to 111°, to conform [illegible] Wagner's sample shaft.	Howard.
[illegible] 1/64" finish to front end of first cam, and put 1/8" [illegible] dist on machine drawing.	Howard.
[illegible] chamber to extend 1-3/64" from flange, on account [illegible] change which calls for threading full length of [illegible]	Howard.
[illegible] Limits at point marked "A" from .6850 to .670. .6860 .675	Howard.
[illegible] over all length from 22-25/32" to 22-23/32" by [illegible] the extreme end of shaft which is at point marked [illegible] this distance being changed from the first step to [illegible] end of shaft from 1-11/64" to 1-13/64"; also specified [illegible] from on each end of shaft.	Howard.

(OVER)

11-14-12 #860 -2	Changed angle between the inlet and exhaust cams from 111° to 115° - 45'. This change should be made as quickly as possible because owing to the variation of the cam shafts as they are now coming, we often do not have sufficient stock for finish.	289-2 Calamb.
12-5-12 #879	We have added note specifying the parting line for this forging to be normal to center lines fo exhaust cams #1 and #4. Noted Received from GVH stated:- "To help us convince the forging companies of the fact that there is enough metal in the 1913 cam shaft (when correct) for making the 1913 camshaft, we are sending you a special sketch showing that the greatest difference between the 1912 and 1913 forging - only 1/64".	Calamb.
12-19-12 #886 -2	Have changed note specifying that the dies for this forging shall be parted on the centerline of inlet cams #2 and #3 instead of on the center line of exhaust cams #2 and #3. Have made this change in the drawing because all the different forging companies who ar making these camshafts prefer to part their dies on the centerline of inlet cams#2 and #3.	Calamb.
2-27-13 #910 -2	Have added note specifying that holes for cam gear dowel pins be located from inlet cam #1.	Martin

DEFENDANT'S EXHIBIT NO. 289

FORGING DRAWING. 289-3 Card No.

SYMBOL NO. (E) T-410

RECORD OF CHANGES

DATE OF REC.	NAME OF PART 1 CAM SHAFT.	
1-9-14 [illegible] -1	Changed diameter of shaft between rear end, and exhaust cam #4; between exhaust cams #2 and #3; also between flange on front end and exhaust cam #1 from 13/16" to 27/32".	Calamb.
	Changed length of 7/8" shoulder between flange and front end of shaft from 25/32" to 3/4" and the distance between flange and the front end of 3/4" shoulder at front end of shaft from 1-5/64" to 1-5/64". This changes the distance between front end of cam shaft and the end of 3/4" shoulder from 1-13/64" to 1-13/64".	Dagner.
	Changed thickness of flange at front end from 5/16" to 11/32" changing the distance between the rear side of flange and the center line of exhaust cam #1, from 2-3/8" and the front end of exhaust cam #1 from 1-7/8" to 1-55/64", and the distance between the front side of flange and front end to 7/8" shoulder from 3/4" to 25/32", also the front end of 3/4" shoulder from 1-5/64" to 1-1/16". Between the bottom of crown at front end of cam shaft from 2-3/32" to 2-17/64". These changes will take effect when the dies are resunk.	Dagner.
	(Cont)	

		289-4
10-9-15 #857 -6	Have specified the symbol number and forging company's trademark to be added at the point indicated by note and arrow. Changes to be incorporated in all new dies which are being made, and in all old dies when they are resunk.	Calamb.
1-18-16 #878 -1	Changed diameter for base of cams from 7/8" to 57/64". This change is to take effect in all dies which are being made/ and in all old dies when they are resunk.	Diehl.
2-23-16 #881 -4	Changed distance between bottom of crown at end of shaft and end of 3/4" shoulder from 1-13/64" to 1ell/64", and distance between end of 3/4" shoulder and flange from 1-1/16" to 1-3 /32". This change is to take effect in all new dies which are being made, and in all old dies when they are resunk. All forgings on hand to be used up.	Diehl.
12-24-16 #980 -9	Steel for this part is to be hot rolled. Specified use on 1917 cars.	Calamb.
2-2-17 #941 -2	Removed note which specified symbol number and trademark to be placed between inler cams #1 and #2. Looking from rear end of shaft we have specified the flange to be flattened 3/8" wide on left hand side of center line for inlet cams #2 and #3, specifying trademark to be placed on this flat. This means that symbol number will be omitted form forgings. This	
	cont'd card #8.	

FORGING DRAWING. 289-5 Card #5.

SYMBOL NO. T-410 (Z)

RECORD OF CHANGES

NO. OF REQ.	1 NAME OF PART CAM SHAFT.	
5-6-17 #641 -2 cont'd	change was made because when symbol number and trademark are placed on side of shaft between inlet cams #1 and #2, they are both machined off and while we do not require the symbol number to be placed on the forging, we do require the trademark in order to know where defective forgings are made. This change is to take effect when dies are resunk. All forgings on hand to be used up.	Wagener.
4-9-17 #650	Specified this part for use on Model H truck, 1917.	Galamb.
9-4-17 #676	Specified for use on 1918 cars.	Galamb.
12-16-18 #712-926	Changed type of steel from "H" to "O". This change is to take effect at once, forgings on hand to be used up.	Galamb, Wanderese Martin.
1-16-19 #716-1015	Changed diameter of cams at base from 57/64" to 57/64" 59/64". This change to take effect when dies are resunk, forgings on hand to be used up.	Degener.

(OVER)

289-6

3-3-19 #726-1518	Removed dimension specifying the length of flat surface on the edge of flange to be 3/8" and added dimension specifying the distance between the flat surface and the edge of flange ro be 1/8" also specified the trademark to be placed close to one end of the flat surface.	Degener.
5-6-19 #773-1767	Specified stock to be bought as follows: .990 x 130 one bar equals 28.95 lbs., 5 shafts per bar. 1.010" 130-1/2" Shorter lengths will be accepted provided they come in multiples of 26".	Findlater.
7-18-19 #786-2305	Brought drawing up to date with the forgings as they are being made by outside companies, by changing the diameter of shaft between all the cams, except #2 and #5 exhaust from 23/32" to 15/16". Change to take effect at once.	Degener.
12-5-19 #794-3088	Specified dies to be parted on a line 12° 45' from the centerline of exhaust cams #1 and #4 instead of on the centerline of inlet cams #2 and #3, also specified the flange to be flattened on the right side of parting line instead of on the left side. These changes were made for convenience in forging and are to take effect when dies are resunk. Change to be incorporated in dies which are not in use. Specified use for 1920 cars.	Rouse.

Form 1000 (W) SYMBOL NO. T-41C FORGING DRAWING. 289-7 Card 84.

RECORD OF CHANGES

NO. OF REQ.	1 NAME OF PART CAM SHAFT.	
12-13-19 #776-3097	We have specified the flange to be flattened on the L.H. side of parting line instead of R.H. side.	Thrall.
2-9-20 #784-3401	Removed stock specifications as follows: Stock .990" D x 130" ; 1 bar equals 28.95 lbs., 5 sahfts 1.010 130-1/2 per bar, shorter lengths will be accepted provided they come in multoples of 26".	Findlater.
5-7-20 #796-3894	Changed material from Hot Rolled Steel, type "G" to Hot rolled type "E" Selected Steel of the following analysis:- Carbon .32 - .37 Manganese .70 - .85 Phosphorus .04 max Sulphur .05 max Silicon .07 - .15 (Wandersee) The above change in the type of steel is to be made as soon as possible without holding up production ; Type "G" Forgings on hand to be used up.	

289-8

10-12-20 FOR 1921

824

5093-830 12-20-20	Changed diameter of shoulder for large time gear from 7/8" to 29/32" for convenience in machining. This change is to take effect as soon as possible without holding up production, and is to be incorporated at once in dies not in use, and new dies which are being made. Forgings on hand to be used up.	Calumb
2-27-22 #482	Changed type of steel from "E" selected TO Type "EE", also added specification for stock used by FORD MOTOR COMPANY as follows, 1" diameter X 13 feet, 5865 lbs required per 1000 Forgings, shorter lengths in multiples of 26", shortest length 104".	Findlater & Wandersee
7-13-23 9791	FOR 1922 23	
5-11-24 10804	Added 3/16" to front end of exhaust cam #1, changing the length from 15/16" to 1-1/8" & distance between cam & flange from 1-55/64" to 1-43/64".	Balmer

SYMBOL NO. T-410 — FORGING DRAWING 289-9 — CIRD #5

RECORD OF CHANGES

NO. OF REQ. 1	NAME OF PART Cam Shaft	
4-7-24 10964	Changed length of stock from 13 feet to 153"plus or minus 0. number of pounds required per 1000 forgings from 5865 to 5667, multiples from 26" to 25-1/2" & shortest length from 104" to 102" plus or minus 0.	Findlater
1-7-25 12436	SPECIFIED FOR 1925	
5-8-25 13043	Removed flat spot and trade mark from edge of flange.	Findlater
5-18-26 17485	Changed size of stock from 1" diameter x 153 ± 0, 5.667 lbs., req. per 1.000 forgings, shorter length in multiples of 25-1/2, shortest length 102 ± 0. - 2C- 1" dia. x 144-1/4, 5.340 lbs. req. per 1.000 forgings, shorter lengths in multiples of 24 + 1/4, shortest length 96-1/4.	Lesko
7-16-26 18129	Changed length of bar stock from 144-1/4" to 240-1/4"	Galamb.
10-21-26 19043	Changed weight of stock required per 1.000 forgings as follows: From 5340 to 5312.5 lbs. and specified for 1927.	289-10 Witzig.

1596

PRICE MARINE. 290-1 Card #1.

RECORD OF CHANGES

	NAME OF PART	CAM SHAFT.
	tive position between the exhaust and inlet cam was [illegible] 120° - this has been changed to 111°, to conform with Mr. Engineer's sample shaft.	Howard.
	Limit on the gear end from .8115 to .8125. Also .8119 .8125	
	the grinding at the point marked "A".	Galamb.
	1/16" finish to front end of first cam, and put 1/8" [illegible] on machine drawing.	Howard.
	[illegible] room to .8115 and .8125 room.	
	[illegible] face of cam gear dowel pin hole from .8115 to .8130 .8125 .8135	
	the diameter of groove, located next to exhaust Cam [illegible] .725 to .726 .727.	Howard.
	[illegible] thread on commutator end, change from 29/32" [illegible] to 9/16".	Howard.
	[illegible] limits at point marked "A" from .6860 to .670 .6840 .672.	Howard.
	(OVER)	

290-2

12-6-11 #63	Increased length of Shaft, on threaded portion, from face of flange to outer end of shaft, 1/16", changing the dimension from 2-1/4" to 2-5/16. We have also shown the 1/16 crown, on end. Also changed length of thread, on threaded portion, from end of shoulder to end of thread, from 45/64 to 13/16, to facilitate the drilling of this hole, which is 1/8" drill. By adding 1/16 to the end of shaft, the over all length was changed from 22-21/32 to 22-23/32.	Howard.
4-1-12 #290 -3	Specified that the rear side of flange for cam gear and the front end of the exhaust cam #1 be ground.	Galamb.
[illegible] #904	Called for centers in the ends, centers to be made with a letter C center drill.	Martin.
4-11-12 #914	Redesigned, bringing the shape of cams up to date with the change on 1-293; also changing the angle between the exhaust and inlet cams from 111° to 115° 25'. This change to take place on 1915 cars. If however there are any cam shafts of our present design left over, they are to be used up before starting on the new. Forging drawing will not be affected by this change.	Galamb.
8-8-12 #935 -1	Changed angle between center lines of exhaust and inlet cams from 115° 25' to 115° 21-1/2'.	Galamb.
9-21-12 #951	Changed diameter for base cams from .8125 to .812 .8130 .813.	Galamb.

DEFENDANT'S EXHIBIT NO. 290

SYMBOL NO. T-410 (2) FINISH SIZE. 290-3 Card #2

RECORD OF CHANGES

NO. OF REQ.	NAME OF PART CAM SHAFT	
11-9-12 #367 -2	Changed angle between center lines of Inlet & Exhaust Cams from 115° - 21-1/2' to 115° - 45'.	Howard.
3-4-13 #404 -2	Brought drawing up to date with the camshafts as they are being made by specifying that the center lines through dowel pin holes and exhaust cams #1 and #4 be at an angle of 1° 30' instead of coinciding with each other. Also changed the angles between the inlet and exhaust cams from 115c - 45' to 115° - 50'.	Galamb.
3-27-13 #410 -3	Have specified the center line through cam gear dowel pin holes to be located 114° - 30' from centerline of inlet cam #1 instead of 1° - 30' from the centerline of exhaust cam #1. This change was made for convenience in machining only, that is, owing to the variations in the forgings the holes can be more accurately located from inlet cam #1 than they can from exhaust cam #1. The location of the holes remains unchanged.	Martin.
3-14-14 #475 -3	Changed thickness of flange from 1/4" to .248 .252	Galamb.
3-19-14 #476 -2	Changed distance between flange on front end and bottom of shoulder for commutator head, from 1-3/32" to 1.090 1.100 (OVER)	Galamb.

290-4

4-4-14 #479 -3	Changed size of center drills in ends from letter C to letter F.	Banta.
1-23-15 #532 -6	Changed diameter of shoulder for cam gear from .8126" to .8135" .812" Specified the ground shoulders for cam shaft bearing, .813" center and rear, to be connected with the cams at ends with 1/32" radius. 1/32"	Galamb & Degener.
12-21-15 #568 -1	Called for a 45 degree bevel 3/64" wide at end of 13/16" threaded shoulder, for cam gear lock nut. This bevel was added to eliminate the feather edges at end of threads which become easily distored and cause trouble when assembling lock nut. Changed specifications for 13/16" x 16 threads from UBS to UBT, and the 9/16" x 18 threads from UBS to SAE. Specified this shaft to be used on 1916 cars. Above change in specifications for threads does not imply any change in shape but merely in method of specifying them.	Galamb.
3-7-16 #584 -1	Changed width of bevel at end of 13/16" threaded shoulder from 1/32" to 1/16". Removed groom from front end of shaft and 1/64" and called for a 45° bevel, 1/32" wide. The above mentioned bevels were added in order to eliminate feather edge of end of threads, which makes trouble when assembling cam gear lock nut and commutator head nut, and is to take immediate effect, all shafts on hand to be used up.	Howard.

SYMBOL NO. T-410 (E) FINISH SIZE. 290-5 Card #3

RECORD OF CHANGES B

NO. OF REQ. 1 NAME OF PART CAM SHAFT

5-19-16 #595 -1	We have specified the name Ford to be stamped in position indicated by note and arrow.	Banta.
1-11-17 #633 -2	Specified hole for commutator head rivet to be drilled only 5/16" deep, instead of clear thru the shaft, and called for countersink 1/32" deep in top of hole. Brought drawing up to date by specifying the steel of which this shaft is made to be hot rolled. Specified use on 1917 cars.	Banta.
2-8-17 #638 -4	Looking at view showing front end of cam shaft, we have specified hole for commutator head pin to be below instead of above horizontal center line, the angle between center line of pin hole, and horizontal center line of shaft to remain 40°.	Banta.
4-9-17 #650	Specified this part for use on model H truck, 1917.	Galamb.
9-4-17 #676	Specified use on 1918 cars.	Galamb.

over

290-6

11-30-17 #686-866	Brought drawing up to date by specifying front end of holes for time gear dowel pins to have a 45° bevel, 1/64" wide. This bevel was added to prevent pin from shearing small bits of metal off the edge of hole and forcing same into T-411, cam shaft bearing, front.	Perini.
3-5-18 #699-860	Called for a 45° bevel 1/64" wide on the front edge of flange at front end.	Degener.
12-16-18 #718 -924	Changed type of steel from "H" to "G". This change to take effect at once; forgings on hand to be used up.	Galamb, Wandersee & Martin.
6-18-19 #744-2016	Added note specifying the 13/16" x 16 USF, Threads next to flange at front end, to be Milled and that angle between centerline of threads and face of flange to be 90 deg. plus or minus 0.	Galamb.
6-26-19 #748-2088	Brought up to date by specifying these shafts to be Cooper plated .0015" thick before grinding.	P.E.Martin.
7-30-19 #755-2206	Brought drawing up to date as follows: Added letter "L" hole in flange to be used for driving shaft while machining.	Degener.

SYMBOL NO. T-410 (Z) FINISH SIZE. 290-7 Card #4. B

RECORD OF CHANGES

NO. OF REQ. 1 NAME OF PART CAM SHAFT

11-7-19 #769-2365	Removed 1/32 fillets at the ends of center bearing and called for relief grooves 1/8 wide. .734 diameter at the bottom this .737 being the same size as the grooves in the front bearing. This change was made because the fillets have a tendency to spread the bearing when assembling cam shaft to cylinder and is to take effect at once. Grooves to be added to cam shafts on hand if necessary.	Bendict
12-3-19 #766-3111	Brought up to date with the above mentioned change in forging drawing. Specified for use on 1920 cars. Note: These changes were made for convenience in forging.	Rouse
12-13-19 #776-3097	Brought up to date with the above mentioned change in forging drawing also with shafts as they are being machined in shop by specifying the letter "L" hole (for driving while machining) in flange to be located on the R.H. side instead of L.H. side of vertical centerline. (See rear view)	Thrall.
1-19-20 #781-3294	Brought drawing up to date as follows: Changed diameter of bearings from .7488 to .747. Changed diameter of turned part .7491 .749 of shaft between cams from 3/4" to .745. Changed diameter .755	

290-8

	of shoulder which carries time gear from .812 to .810. .813 .813 Changed diameter of shoulder in front of threads for time gear lock nut from .670 to .665. Changed diameter of .675 .675 shoulder which carries commutator head from .5610 to .559 .5615 .561 Changed thickness of flange which supports time gear from .248 to .233. Changed distance between flange and exhaust .253 .238 cam #1 from 1.967 to 1.967. Changed diameter at base of 1.965 1.970 cams from .812 to .805. .813 .813	Galamb
1-30-20. #782-3337	Changed the width of chamfer on flange which supports time gear from 1/64 to 1/32. This change was made to be sure the burr is removed from flange before assembling time gear in place, and is to take effect at once. Shafts on hand to be used up.	Galamb.
3-9-20. #788-3570	Specified the corners at front end of exhaust cam #1 to be rounded with a 1/64" radius. This change is being made to eliminate sharp corner on the front end of cam, which acts as a cutter on the end of Cam Shaft Bearing Front.	

cont'd card #5

RECORD OF CHANGES

	cont'd card #8 Also specified the name "Ford" to be [illegible] inlet and exhaust cams #3, instead of [illegible] #3 and #4; this change being made in [illegible] cams "Ford" where it will not be damaged by [illegible] holds shafts while they are being [illegible] These changes are to take effect at once. The sharp corners on the front end of [illegible] to be filed off by hand until a more effi[illegible] be developed.
5-7-20 #705-3894	Same change as forging drawing, also [illegible] ing cams to be carburized and copper plate[illegible] before grinding. The above change in the [illegible] to be made as soon as possible without [illegible] tion; Type "C" Forgings on hand to be used [illegible]
6-14-20 #808-4106	Changed the diameter of shoulder [illegible] from .810 to .815" .813 .813 This change was made in order to eli[illegible] alignment of and center [illegible]
	Time Gears and is to take effect at once, shafts on hand [illegible] be used up. (Fred[illegible]
9-17-20 #815-4652	Added dimensions and notes giving the rough, finish, and [illegible] specting sizes for diam. of shoulders at front end, [illegible] of flange, and diameters of front, center and rear [illegible] (C. Martin) Note: The above dimensions bring drawings of [illegible] up to date, showing the dimensions being used in the shop at the present time.
10-12-20 824	FOR 1921
5799-840 7-21-21	Changed distance from rear of flange for time gear to the [illegible] #4 exhaust cam from 18-1/8" TO 18-13/32"
11-4-21 7138	Limits have been specified on the Pitch Diameter of Ethereals [illegible] bringing them up to date with the sizes adopted by the Bureau of Standards. (For sizes see drawing).
2-27-22 7482	Changed type of Steel from "E" selected to Type "[illegible]".
6-19-22 7967	Specified cams to be finished on the ends.
8-13 1923 FOR 1922 23 9885	8-13 1923 FOR 1922 23 9885

FORM FORM 918
SYMBOL NO. T-410
Z

290-11

Card #6

RECORD OF CHANGES

NO. OF REQ. 1 NAME OF PART Cam Shaft (Finish Size)

11-28-23
10291

Changed radius with which the corner at front end of exhaust cam #1 is rounded from 1/64" to 1/32"-3/64"

12-14-23

3-11-24
10804

Added 3/16" to front end of exhaust cam #1, changing the length from 7/8" to 1-1/16" & distance between cam & flange

Calamb

	FROM	TO
	1.958"	1.771"
Rough Turn	1.962"	1.775"
	1.967"	1.780"
Grind	1.969"	1.782"
	1.967"	1.780"
Insp. Grind	1.970"	1.783"

Also changed distance between front end of exhaust cam #1 & rear end of exhaust cam #2 from 7" to 7-3/16". Removed 1/32" - 3/64" R from the corner at front end of exhaust cam #1 & specified sharp edge to be removed with a stone. changed fillet at rear side of flange from 1/8" to 3/32"- 1/8" R

290-12

5-2-24
11117

Changed rough turn diameter of rear bearing from .780"--.800" to .780"-.790" & of shoulder which supports gear from .850"--.870" to .850"--.860"; also rough turn length of front bearing from 1.771"--1.775" to 1.766"-1.771.

C. Martin

10-15-24
11999

Changed rough turn dia.. of rear bearing from .780" to .790" .780" & rough turn dia. for gear post from .850" to .845". .785" .860" .850"
Also specified for 1925.

C. Martin

3-25-25
No. Eng. Information issued.

CHANGED NOTE: "For development of cams see Drawing T-533 to Sketch 923"

5-8-25
12043

Brought drawing up to date with change in forging by removing flat spot from edge of flange. Also specified relief groove in corner between flange and shoulder which supports time gear.

Calamb

6-14-25
17803

SPECIFIED for 1926.

Calamb.

290-13

Card No. 7.

Name CAM SHAFT

Changed diameter of bearings after grinding from .748 to .747, and removed
.749 .749
inspection limits (.747). Changed length of front bearing after grinding from
(.749)
1.780 to 1.780 and removed inspection limits (1.780). Removed .253 inspection
1.782 1.782 (1.783) .252
limits (.253) for thickness of flange. Also specified for 1927. (P E Martin)
(.252).

Changed diameter of shoulders which are not ground from .745 to .780, dia.
.755 .790
of bearings from .747 to .748, diameter at bottom of relief grooves from
.749 .749
.734 to .737, diameter at base of cams from .805 to .810, thickness of flange
.737 .740 .813 .813
from .248 to .248 and length of front bearing after grinding from 1.780 to 1.780
.252 .258 1.783 1.782
Removed inspection limits (.665) from diameter of shoulder in front of
(.675)
threaded shoulder for cam gear lock nut. Galarb.

Card No. 1

[illegible] 1/37 No. of cards [illegible]

[illegible] Sheldrick.

[illegible] Sheldrick.

[illegible] Sheldrick.

[illegible] Sheldrick.

[illegible] Sheldrick.

(over)

DEFENDANT'S EXHIBIT NO. 291

291-2

11-17-27 4930	Drawing retraced, no change in part.
4-7-28 8115	Revised stock sizes.
7-19-28 9453	Specified the "EEE" steel out of which shafts are made to be "Select".
8-22-28 10035	Changed heat treatment before machining from 1470° F., cool slowly. Brinell hardness 170-228. to: 1560° F., cool slowly. Brinell hardness 149-179.
9-28-28 10419	Removed second and fourth bearings.
10-18-28 10578	Increased width of cams 1/8 and length of hub on flange end 1/32, changing other dimensions to correspond. Changed length of stock from 241-3/4 to 242-1/2 and weight per 1000 pieces from 11,500 lbs. to 12,145 lbs.
11-10-28 10903	Changed length of stock from 242-1/2, multiples of 24-1/4, shortest length 169-3/4, to: 241-3/4, multiples of 24-1/8 + 1/2, shortest length 169-3/8.
12-18-28 11087	Removed stock size.

(See card #2)

291-3

Part No. A-6250-A1 Forging Size
Drawing Size X

CAM SHAFT

1 req. All Chassis

Card No. 2

No. of Cards

4-11-29 12452	Changed length of rear bearing from 1-3/16 to 1-7/32 and overall length of shaft measured to bottom of draft from 21-7/32 to 21-1/4.
12-28-29 14938 (Supp.#1)	Added suffix "A1" to symbol number.

Type A-6250-41
Oper. Finish Size
Dwg. Z

292-1

Name CAM SHAFT

Card No 1
No. of cards 2

6-24-27 EDF 813	Added view showing cam outline and valve timing diagram. Reduced diameter of cam gear flange from 2-13/16 to 2-5/16 and dimension locating .3120 rear from 1.1875 to .9375. .3125 ALSO RELEASED FOR PRODUCTION. Sheldrick.
7-6-27 EDF 1077	Two intermediate bearings 1.559 diameter x 7/8 long added. 1.560 Rear bearing enlarged from .872 to 1.559 diameter. .873 1.560 Sheldrick.
11-4-27 4417	Second dowel hole added .929 below centerline and offset .125.
11-17-27 4930	Section of undercut added. Drawing retraced.
1-10-28 6462	Hole added on driving flange and note locating it accurately on centerline of #2 exhaust cam.

OVER

292-2

2-7-28 7053	Specified temperature of quenching solution to be 65° - 70° F., and parts to be removed from quenching solution at a temperature of 200° - 250° F. and drawn in boiling water 10 minutes.
7-19-28 9633	Specified the "EKE" steel out of which shafts are made to be "select".
9-28-28 10419	Removed second and fourth bearings. Changed heel diameter of cam from .954 to .953 and specified heel of cams to .955 be concentric with bearings within .002 total indicator reading. Cams are designed for theoretical gap of .015. Specified valves to be set to .010 gap. .013
2-6-29 11934	Changed length of front bearing from 1-25/32 to 1-13/16. and width of undercut from 1/8 to 3/16. Specified that width of all 45° chamfers on bearings be 1/64 instead of 1/64 and width of 30° chamfer on rear bearing 3/64 be 1/16 instead of 1/16, also width of chamfer on flange for rear be 1/64 3/32 3/64 instead of 1/32. Specified that distance between rear face of flange and front face of rear bearing be 18-15/16 instead of 18-15/16. 18-31/32

Dwg
Oper
Type
Name

(See card #2)

DEFENDANT'S EXHIBIT NO. 292

292-3

CAM SHAFT

Gard No. 2

1 req. All Chassis 1930

No. of Cards

Changed angle of chamfer on end of rear bearing from 30° to 45° and width of chamfer from 1/16 to 1/64.
3/32 3/64

Changed distance between rear face of gear flange and rear end of shaft from 20 to 20-1/32, which changes overall length from 21-1/16 to 20-1/32 20-1/16 21-3/32 to 21-3/32.
21-1/8

Specified that pitch diameter of gear must be concentric with bearing diameter within .004 total runout.

Recommended dowel pin holes, specifying that same be located on a .9975 radius instead of .9975 above and .939 below centerline.

Specified that front corner of dowel holes be chamfered 45° x 1/64 wide and that rear corner of flange be chamfered 45° x 1/64 wide maximum.

(over)

292-4

10-15-29 14514 Specified 1-16-N-4 Thread instead of 1-16-USF, changing pitch diameter from .9562 to .9582 .9594 .9598

12-15-29 14733 Added suffix "A" to distinguish from "B" design. Specified one Oil Groove, each bearing instead of two, each bearing, to bring records up to date with present practice.

12-15-29 14733 (Supp.#1) Changed suffix from A to "A1"

1-30-30 15076 Changed Dowel Pin Holes in Cam Shaft from .312-.3125 to .3095-.310

#295
2/1/39

Ford Motor Company

FACTORY AND GENERAL OFFICES
3674 SCHAEFER ROAD
DEARBORN MICH

February 1, 1939

Bodman, Longley, Middleton,
Bogle, & Farley
1400 Buhl Building
Detroit, Michigan

Att: Mr. Farley

Dear Sirs:

Per your request today, we are giving below data of speeds and feeds on the Camshaft Shaper, comparing the Model "T" and Tractor Camshafts, based on information from you of 700 R.P.M. for Driving Pulley:

Driving Pulley runs @ 700 R.P.M.
Driven Gear = 13" Pitch Diameter
Driving Gear = 4-1/6" Pitch Diameter
Speed of Crank = $\frac{700 \times 4\text{-}1/6}{13}$ = 220 R.P.M.,
or 220 strokes per minute of slide.
Feed per stroke = 1/32.

Circumference of Model "T" Cam = approx. 2.9"
1/32 feed per stroke gives $\frac{2.9}{1/32}$ = 92.8,
or 93 strokes for total rotation of cam.
Total cutting time per shaft = $\frac{60 \times 92.8}{220}$ = 25.3 seconds.

Circumference of Tractor Cam = approx. 4.4"
1/32 feed per stroke gives $\frac{4.4}{1/32}$ = 140.8
or 141 strokes for total rotation of cam.
Total cutting time for cam = $\frac{60 \times 141}{220}$ = 38.5 seconds.

Surface speed of tool for Model "T":
220 strokes per minute
Cutting stroke 240°, Return stroke 120°, of revolution
Distance of stroke = 1-1/4"
Surface speed of tool = $\frac{220 \times 1\frac{1}{4} \times 3}{2 \times 12}$ = 34 ft. per min. average.

(Continued on sheet #2)

DEFENDANT'S EXHIBIT NO. 295

Surface speed of tool for Tractor:

220 strokes per minute
Cutting stroke 240°, Return stroke 120°, of revolution
Distance of stroke = 1-3/8"

Surface speed of tool:

$$\frac{220 \times 1\text{-}3/8 \times 3}{2 \times 12} = 38 \text{ feet per minute average.}$$

(This speed is OK. (not tooglass))

Very truly yours

FORD MOTOR COMPANY

WM F PIOCH

NLB:JKK

WM F PIOCH

Mechanical Design Dept.

1610

FORD FORM 4004-A

#296
393
1-1-39

ORIGINAL

Ford Motor Company

HIGHLAND PARK, MICH.

This Order Number must appear on all Packing Slips, Bills of Lading, Shackles, Packages and Invoices

The FORD MOTOR COMPANY, of Highland Park, Michigan, first party, hereby agrees to purchase and receive, and

Purchase Order No.

Date

DELIVERY REQUIRED

Shipments are only to be made in accordance with the first party's "release authorization" which will be issued later. Release authorization (Form No. 3165 sample of which is attached hereto) shall when issued become a part hereof.

second party agrees to manufacture, sell and deliver materials specified below, subject to the terms and conditions stipulated:

SHIP VIA — Routing and manner of shipment will be included in Release Authorization which will be issued later and which becomes a part of this order.

TERMS

F. O. B.

QUANTITY	SYMBOL	DESCRIPTION OF MATERIAL	PRICE

CONDITIONS

Acceptance: This order constitutes an offer on the part of First Party upon the conditions and terms and at the prices stated herein, and to constitute a contract binding upon First Party, said offer must be accepted by execution of the acknowledgment in the form attached hereto by Second Party, it being expressly understood that no other form of acceptance, verbal or written, will be valid or binding upon First Party. There are no agreements or understandings other than those contained in this order.

Crating: No charges will be allowed for crating, boxing or drayage unless stated herein.

Inspection: Materials purchased are subject to First Party's inspection and approval and if rejected, will be held at Second Party's risk and returnable at Second Party's expense.

Invoices: All invoices must be rendered in duplicate, prices and extensions to appear on original only. Separate invoices required for each individual shipment.

Shipping Documents: Original bills of lading or express receipts, etc., properly signed by carrier representative, must be attached to the Second Party's invoices and both mailed to Ford Motor Co., Detroit, Mich., Attention Purchasing Department, not later than day after shipment. In case shipments are consigned to the First Party's Branch Assembly Plants, original bills of lading should be sent to the branch, while the signed duplicates should be forwarded to Detroit, Mich., with the Second Party's invoices.

Packing Slips: First Party will not receipt for materials unless accompanied by packing slips. Original packing slips for carload lots must be enclosed in envelope, (unsealed) addressed to Ford Motor Co., and marked inside our name and [illegible]. Original packing slips for L. C. L. shipments must be placed in each package. Copies relating to ALL shipments to be mailed direct to Ford Motor Co., at point of destination, "Attention Receiving Room."

Statements: To insure settlements as agreed, statement of account should be rendered monthly, in time to reach the First Party by the 5th proximo.

Cancellation: First Party reserves the right to cancel this order or any part thereof, if material is not shipped according to deliveries above specified, or for causes due to any acts or demands of the United States Government, or to fires, strikes, or other causes beyond First Party's control, or if material is not in accordance with blue prints, approved samples or specifications, or is defective in workmanship or material, or is not satisfactory to First Party.

Patents: Second Party guarantees that the sale or use of its products will not infringe any United States or foreign patent, and undertakes to indemnify First Party against all judgments, decrees, costs and expenses resulting from such alleged infringement, and covenants that Second Party will, upon request of First Party and at Second Party's own expense, defend, or assist in the defense of, any suit or action which may be brought against First Party or those selling or using any products of First Party by reason of any alleged infringement of any patent in the sale or use of Second Party's products.

Freight Rate: The price herein specified is based on present rate of freight and any reduction in present freight rates is to be credited to the account of the first party.

Ford Motor Company

By _____
Purchasing Dept.

Purchase Order No.

ACKNOWLEDGMENT OF ORDER

Acceptance of order must be made on this form, without change in the terms, prices or conditions, and without additions thereto. Otherwise acceptance will be returned to Seller.

FORD MOTOR COMPANY
DETROIT, MICHIGAN

Date_____

Gentlemen:

We hereby acknowledge receipt of your ORDER NO. _____ which we accept subject to all terms and conditions stipulated thereon.

Firm Name_____

OVERSIZE PAGE – SEE NEXT FRAME
FOR REMAINDER OF PAGE

4-1-39 Ford Motor Company

HIGHLAND PARK, MICH.

This Order Number must appear on all Packing Slips, Bills of Lading, Machines, Packages and Invoices

The FORD MOTOR COMPANY, of Highland Park, Michigan, first party, hereby agrees to purchase and receive, and

Purchase Order No.

Date

DELIVERY REQUIRED

Shipments are only to be made in accordance with the first party's "release authorization" which will be issued later. Release authorization (Form No. 3565 sample of which is attached hereto) shall when issued become a part hereof.

second party agrees to manufacture, sell and deliver materials specified below, subject to the terms and conditions stipulated:

SHIP VIA — Routing and manner of shipment will be included in Release Authorization which will be issued later and which becomes a part of this order.

TERMS

F. O. B.

QUANTITY	SYMBOL	DESCRIPTION OF MATERIAL	PRICE

CONDITIONS

Acceptance: This order constitutes an offer on the part of First Party upon the conditions and terms and at the prices stated herein, and to constitute a contract binding upon First Party, said offer must be accepted by execution of the acknowledgment in the form attached hereto by Second Party, it being expressly understood that no other form of acceptance, verbal or written, will be valid or binding upon First Party. There are no agreements or understandings other than those contained in this order.

Crating: No charges will be allowed for crating, boxing or drayage unless stated herein.

Inspection: Materials purchased are subject to First Party's inspection and approval and if rejected, will be held at Second Party's risk and returnable at Second Party's expense.

Invoices: All invoices must be rendered in duplicate, prices and extensions to appear on original only. Separate invoices required for each individual shipment.

Shipping Documents: Original bills of lading or express receipts, etc., properly signed by carrier representatives, must be attached to the Second Party's invoices and both mailed to Ford Motor Co., Detroit, Mich., Attention Purchasing Department, not later than day after shipment. In case shipments are consigned to the First Party's Branch Assembly Plants, original bills of lading should be sent to the branch, while the signed duplicates should be forwarded to Detroit, Mich., with the Second Party's invoices.

Packing Slips: First Party will not receipt for materials unless accompanied by packing slips. Original packing slips for carload lots must be enclosed in envelope, (unsealed) addressed to Ford Motor Co., and tacked inside car door. Original packing slips for L. C. L. shipments must be placed in each package. Copies relating to A.L.L. shipments to be mailed direct to Ford Motor Co., at point of destination. "Attention Receiving Room."

Statements: To insure settlements as agreed, statement of account should be rendered monthly, in time to reach the First Party by the 5th proximo.

Cancellation: First Party reserves the right to cancel this order or any part thereof, if material is not shipped according to deliveries above specified, or for causes due to any acts or demands of the United States Government, or to fires, strikes, or other causes beyond First Party's control, or if material is not in accordance with blue prints, approved samples or specifications, or is defective in workmanship or material, or is not satisfactory to First Party.

Patents: Second Party guarantees that the sale or use of its products will not infringe any United States or foreign patent, and undertakes to indemnify First Party against all judgments, damages, costs and expenses resulting from such alleged infringement, and covenants that Second Party will upon request of First Party and at Second Party's own expense, defend, or assist in the defense of, any suit or action which may be brought against First Party or those selling or using any products of First Party by reason of any alleged infringement of any patent in the sale or use of Second Party's products.

Freight Rate: The price herein specified is based on present rate of freight and any reduction in present freight rates is to be credited to the account of the first party.

Ford Motor Company

By _____
Purchasing Dept.

Purchase Order No.

ACKNOWLEDGMENT OF ORDER

Acceptance of order must be made on this form, without change in the terms, prices or conditions, and without additions thereto. Otherwise acceptance will be returned to Seller.

FORD MOTOR COMPANY
DETROIT, MICHIGAN

Date_____

Gentlemen:

We hereby acknowledge receipt of your ORDER NO. _____ which we accept subject to all terms and conditions stipulated thereon.

Firm Name_____

_____
Signed by Officer of Company

Please detach, sign and return this form, immediately, by mail.

DEFENDANT'S EXHIBIT NO. 296

Card No

T- F-446
Oper Forging.
Des Z-Size.

Name CAMSHAFT.
1 Reqd. Fordson Tractor.

7-3-18	Length of front bearing surface changed from 3" to 2-15/16" and 9-3/8" dimension changed to 9-7/16"
2-4-19	Changed 2-1/8" to limits 2-1/8" - 2-1/32" and 1-7/16" to 1-7/16" - 11-32" Overall 29-1/16" given limits 29-1/16" to 29-1/8" added section "BB" Section "AA" showing maximum and minimum forging size. also finished camshaft Former 1-1/16" dimension given limits to 1 to 1-1/16" locating cam apex.
3-6-19	Changed type "G" steel drop forging to type "G" H.R. special forging bars.
3-18-19	Cam profile 1 - 1-1/16" changed to 1-1/32" Cam profile 43/64R changed to 11/16R Diameter between cams 1-5/16" - 1-1/4 changed to 1-7/32" Diameter bearings 2-1/8" - 2-1/32" changed to 2-1/16" Diameter for timing gear 1-7/16" - 1-11/32" changed to 1-11/32" note added "To allow 1/16" on a side for wear on dies."
3-26-19	Overall length changed from 29-1/16" to 29-1/8" to 29-1/16" to 29-3/16" these limits agreed upon by manufacturing and inspection departments to give basis for accepting forgings. Added note "Part dies on this line to avoid flash on point of number #1 cam.
5-6-20	Shortened journal (rear) 1/4" to conform to shortened bearing in cylinder. This reduces over roll length from 29-1/16" - 29-3/16" to 28-13/16" - 28-15/16"
4-12-21	Changed type of steel from "F" to "H" special to eliminate copper plating and carbonitride. This steel differs from type "F" in carbon content only and is 40 - 45 instead of 35 - 45
6-4-21	Added section "CC" and note "Stamp symbol 446-1,2 makerstrade mark and letter "F" on flat as shown."
8-25-22	Changed material from type "F" steel to type "EE" steel to standardize on stock as these two are almost identical.
12-6-22	Corrected analysis to conform to "EE" steel.
12-30-22	1" width of cams increased to 1-1/4" to provide greater contact surface with push rod and to reduce wear.
8-3-23	Changed note "Place symbol ( ) and maker's trade mark here" to "Place symbol ( ) maker's trade mark and die number here" this is to enable the inspection department to tell if forgings are made from dies which have been oked.
11-22-24	Specified "Hot Rolled Steel" instead of "Hot Rolled Special Forging Bar." To reduce cost of steel as this is unnecessary.
1-19-26	Flat for symbol and trade mark removed to location between #3 and #4 inlet instead of #4 inlet and #4 exhaust. This is on account of rolls in quenching fixture running on shaft between #4 inlet and #4 exhaust(Hommel)

DEFENDANT'S EXHIBIT NO. 298

Page #1

Card No._____

Name CAMSHAFT.
1 Reqd. Fordson Tractor.

8-15-18	Recess added to relieve grinding wheel on 1.250" - 1.251" dia. Added 1.270 1.272" turn. Note "Carbonizing.Harden. and grind changed to " Heat Treated. Added 1.955" - 1.958" turn before carbonizing. Added 2" dia, rough turn before copper plating.
8-18-18	New Heat Treatment given camshaft.
7-8-19	2-7/8" dimension changed to 2-13/16" - 9-1/2" dimension changed to 9-9/16" in accordance with change of 7-3- on forging.
7-24-18	Corrected lead of spiral oil groove from 3-1/2" to 7" to agree with tool equipment.
8-31-18	2" rough turn diameter given limits of 1.986 - 1.989"
10-11-18	Added note "Break Corner" on hole for commutator brush.pin.
12-27-18	Added basic pitch diameter .5256 ± .001" - .002" to 9/16" x 18 threads. Added basic diameter Pitch dia. .9535 ± .001" - .002" to 12 x 14 threads.
1-28-19	Basic pitch dia. .5255 ± .001" - .002" changed to pitch dia. .526 - .528" basic (.5255) Root dia. .480" - .485" (Basic .490" variation in lead must (Over)

not exceed ± .0005" in 9 threads = .500" Basic pitch dia. .9535" ± .001" - .002" changed to pitch dia. .953" - .955" (Basic .9535) Root dia. .900" - .905" (Basic .907") Variation in lead must not exceed ± .0005" in 7 threads = .500"

2-15-19	Revised Heat Treatment on camshaft and Flywheel stud as follows:-"Type "5-A" steel to be used after type "A" steel is all used up for F-451 Flywheel stud.
3-6-19	Changed type "C" steel to read type "C" H.R. special forging bar.
3-18-19	Cam profile - 1 - 1-1/16" changed to 1-1/32" - Cam profile 43/64R changed to 11/16R Dia.between cams 1-5/16" - 1-1/4" changed to 1-7/32" - Dia. bearings between 2-1/8" - 2-1/32" changed to 2-1/16" - Dia. [illegible] for timing gear 1-7/16" - 1-11/32" changed to 1-11/32" - Note added "Allow 1/16" on a side for wear on dies.
3-27-19	Added note "Rough turn 1/16" dia. before hardening. Also rough turn .700" - .725" diameter.
6-19-19	Changed rough turn from 1.986" - 1.989" to 1.989" - 2.001" and Changed [illegible] finish turn dimension from 1.955" - 1.958" to 1.965" - 1.968" to conform to present practice and gages. Purpose of change is to allow more metal for grinding.
9-25-19	Removed note"Rough turn 1-1/16" diameter before hardening." Changed note from "Rough turn" to "Rough turn before hardening is .700" - .725" diameter.
5-6-20	Shortened rear journal 1/4" to conform to shortened bearing in cylinder.

Page #2

Item #

T- F-446AR

Oper. Finish

Dwg. Z-Size.

Card No.

Name CAMSHAFT.

1 Reqd. Fordson Tractor.

28-

cont'd This reduces overall length from 15/16" to 28-11/16"

5-6-20
4-23-21 Changed type of steel from "G" to "F" special to eliminate carbonizing and copper plating. Removed 1.989" - 2.001" rough turn diameter as not necessary. Changed oil groove to avoid shart corners on bearing surface and added section "CC" to drawing showing same.

5-14-21 1" threaded shoulder cut back 1/16" to prevent timer roller hub from interfering Added 1/16" x 45° chamfer on 9/16" thread.

5-28-21 Changed Heat Treatment drawing on account of material being changed from typ "G" steel to type "F" steel.

7-30-21 .898" dimension locating center of 2.500 radius changed to .909" to correct error. Added notes "Valve opens" and "Valve closes" to explain 52-1/2° angles

8-25-22 Changed material from type "F" steel to type "EE" steel to stnadardise on stock as these two are alsost identical.

10-24-22 Changed material specified on heat treat charts from type "F" to type "EE" steel to comply with change dated 8-25-22 this does not affect the heat treatment as it is the same for both types of steel.

(Over)

11-24-22 1500° F. 1-1/4" min changed to 1450°f.up to heat in air." drawing accomplished by removing from water while still warm, thus making it unnecessary t reheat.

1-2-23 Widened cams from 7/8" to 1-1/8" to increase bearing on push rod and thus reduce wear.

11-22-23 Specified "Hot Rolled Steel" instead of "Hot Rolled Special Forging Bar." to reduce cost of steel as this is unnecessary.

12-12-23 Added 1/16" x 45° chamfer at front end of front bearing to prevent chipping of corner.

12-18-23 1-3/16" diameter between cams given limits 1/185" - 1/195" dia. to fit heat treating fixture(Herkots)

3-27-25 1470° F.normalizing temperature increased to 1550° F. to allow this camshaft to be run in same furnace with other normalized stock.(Harry Ford)

10-16-28
5.1.1005 Supp#4 Added AR to this part indicating used for repairs only.

11-10-28 Added "AR" to symbol number indicating use for repairs on 1917-1928 Fordson 5.1.1 to Supp #

(Revised 1-10-28) E.J.Farkas

see next card.

TRACTOR PRODUCTION

Month	1917	1918	1919	1920	1921	1922	1923	1924	1925
January		357	5,128	4,860	--	--	7,904	4,837	7,086
February		1,115	5,228	4,395	257	1,702	7,908	7,100	9,300
March		1,351	6,179	3,009	3,781	6,101	11,275	8,457	11,638
April		1,526	2,118	2,381	5,625	7,444	11,386	10,113	11,310
May		1,972	31	3,149	6,170	8,950	11,083	10,029	10,000
June		2,357	2,194	4,024	6,182	9,333	9,001	7,183	8,699
July		3,288	5,560	4,188	3,974	9,657	6,670	5,607	7,830
August		3,412	6,491	4,027	1,654	8,527	8,420	6,000	7,800
September		3,610	6,754	3,741	414	231	7,393	6,225	7,500
October		4,040	6,554	333	525	3,934	8,353	6,900	8,100
November		3,691	6,702	--	425	5,113	7,342	5,400	7,200
December	254	4,448	4,048	--	188	5,760	5,163	5,159	7,705
TOTAL	254	31,167	56,987	34,107	29,195	66,752	101,898	83,010	104,168

2-2-39

1615

DEFENDANT'S EXHIBIT NO. 299

EXHIBIT 301.

SUBSTITUTE PAGES OF MOISE & BURGESS REPORT.

Changes made:

1. Substitution of the Ford cam shaper as the standard of comparison in place of the Landis grinder for computing A-6250 and F-446 costs.

2. Addition of the cost of the straightening operation to the turning operation on the Melling cam lathe for all three types of shafts.

3. Substitution of the Pioch cam mill as the standard of comparison in place of the Landis grinder for computing additional losses "based upon rejection of claims made by defendant, but not substantiated by records supplied."

NOTE: The reproduction herein of certain text copied exactly from Plaintiff's Exhibit Z is not to be taken as an admission of the correctness thereof.

LOSSES SUSTAINED BY FORD MOTOR COMPANY THROUGH USE OF MELLING CAM LATHES FOR ROUGH TURNING CAMS OF CAMSHAFTS T-410, A-6250 AND F-446 FROM JUNE 16, 1925 TO DATE USE OF THESE MACHINES WAS ABANDONED.

MINIMUM **LOSS*** "from June 16, 1925 to February 3, 1931 based upon production claimed by defendant or admitted by defendant's employees"		$35,921.67*
ADDITIONAL LOSSES "BASED UPON REJECTION OF CLAIMS MADE BY DEFENDANT, BUT NOT SUBSTANTIATED BY RECORDS SUPPLIED"		
"Production by Pioch machines, from May 16, 1930 to February 3, 1931, claimed by defendant but not substantiated by records supplied" (Note A):		
May 16, 1930 to December 31, 1930—105,168 A-6250 camshafts at $.006128 (minimum loss per shaft during this period)	$644.47	
January 1, 1931 to February 3, 1931—36,960 A-6250 camshafts at $.006976 (minimum loss per shaft during this period)	257.83	
		902.30
"Production by Pioch machines, from February 4, 1931 to July 31, 1931, claimed by defendant but not substantiated by records supplied."		
"Sufficient Melling cam lathes to have rough turned the cams upon the entire production of camshafts during this period were apparently available for use, the records supplied by defendant not having established their abandonment for this purpose."		
435,157 A-6250 camshafts at $ .006976		3,035.66
TOTAL **LOSS** "BASED UPON POSITIVE RECORDS AND UPON REJECTION OF UNSUBSTANTIATED CLAIMS BY DEFENDANT"		$39,859.63

Note A: (The Pioch machine was available beginning May 16, 1930 and is therefore the correct standard of comparison instead of the Landis grinder):

	1930	*1931*
Cost per shaft using Melling cam lathe, excluding straightening operation	$ .035184	$ .040050
Cost per shaft using Pioch mill with a production of 42 shafts per hour	.029056	.033074
Loss by using Melling cam lathe	$ .006128	$ .006976

* PRINTER'S NOTE: Losses appear in red on the original, and are here reproduced in boldface type.

SUBSTITUTE FOR PLAINTIFF'S EXHIBIT A.

Cost of Machining Cams upon Ford Camshafts with Melling Cam Lathes and with Ford Cam Shapers, and Minimum Loss by Ford Motor Company through Use of Melling Cam Lathes from June 16, 1925 to February 3, 1931. Based on Production Per Hour Claimed or Admitted by Defendant's Witnesses for Camshafts T-410 and F-446, and Calculated Therefrom for Camshaft A-6250.

	Production	Cost Per Shaft		Total Cost		Loss through Use of Melling Cam Lathes
		Ford Cam Shapers	Melling Cam Lathes	Ford Cam Shapers	Melling Cam Lathes	
Model T—T-410						
June 16 to December 31, 1925	1,093,205	$ .031314	$ .033913	$ 34,232.62	$ 37,073.86	$ 2,841.24
1926	1,699,205	.039292	.042554	66,765.16	72,307.97	5,542.81
1927	506,086	.045418	.049188	22,985.41	24,893.36	1,907.95
1928	120,448	.033864	.036674	4,078.85	4,417.31	338.46
January 1 to 15, 1929	1,222	.032914	.035646	40.22	43.56	3.34
Totals, T-410	3,420,166			$128,102.26	$138,736.06	$ 10,633.80
Model A—A-6250						
November and December, 1927	9,287	.048320	.053942	$ 448.75	$ 496.78	$ 48.03
1928	843,456	.037602	.041626	31,715.64	35,109.71	3,394.07
1929	1,961,973	.042127	.046636	82,652.04	91,498.57	8,846.53
1930	1,370,417	.053839	.059601	73,781.88	81,678.22	7,896.34
January 1 to February 3, 1931	37,866	.061284	.067843	2,320.58	2,568.94	248.36
Totals, A-6250	4,222,999			$190,918.89	$211,352.22	$ 20,433.33
Tractor—F-446						
June 16 to December 31, 1925	59,973	.071085	.087154	$ 4,263.18	$ 5,226.89	$ 963.71
1926	99,111	.081124	.099462	8,040.28	9,857.78	1,817.50
1927	100,705	.079195	.097097	7,975.33	9,778.15	1,802.82
January, February, March, 1928	15,875	.075382	.092422	1,196.69	1,467.20	270.51
Totals, F-446	275,664			$ 21,475.48	$ 26,330.02	$ 4,854.54
Grand Total—All Types	7,918,829			$340,496.63	$376,418.30	$ 35,921.67

SUBSTITUTE FOR PLAINTIFF'S EXHIBIT A-1.

SUBSTITUTE FOR PLAINTIFF'S EXHIBIT A-1.

Productive Labor Cost of Machining Cams upon Ford Camshafts with Melling Cam Lathes and with Ford Cam Shapers, and Minimum Loss by Ford Motor Company through Use of Melling Cam Lathes from June 16, 1925 to February 3, 1931. Based on Production Per Hour Claimed or Admitted by Defendant's Witnesses for Camshafts T-410 and F-466, and Calculated Therefrom for Camshaft A-6250.

	Production	Productive Labor Cost Per Shaft		Productive Labor Total Cost		Productive Labor Loss through Use of Melling Cam Lathes
		Ford Cam Shapers	Melling Cam Lathes	Ford Cam Shapers	Melling Cam Lathes	
Model T—T-410						
June 15 to December 31, 1925	1,093,205	$ .016286	$ .017638	$ 17,803.94	$ 19,281.95	$ 1,478.01
1926	1,699,205	.016922	.018327	28,753.95	31,141.33	2,387.38
1927	506,086	.018622	.020168	9,424.33	10,206.74	782.41
1928	120,448	.016450	.017815	1,981.37	2,145.78	164.41
January 1 to 15, 1929	1,222	.017004	.018415	20.78	22.50	1.72
Totals, T-410	3,420,166			$ 57,984.37	$ 62,798.30	$ 4,813.93
Model A—A-6250						
November and December, 1927	9,287	.019812	.021932	$ 183.99	$ 203.68	$ 19.69
1928	843,456	.018266	.020221	15,406.57	17,055.53	1,648.96
1929	1,961,973	.019543	.021635	38,342.84	42,447.28	4,104.44
1930	1,370,417	.021062	.023316	28,863.72	31,952.64	3,088.92
January 1 to February 3, 1931	37,866	.021276	.023553	805.64	891.85	86.21
Totals, A-6250	4,222,999			$ 83,602.76	$ 92,550.98	$ 8,948.22
Tractor—F-446						
June 16 to December 31, 1925	59,973	.026066	.031958	$ 1,563.26	$ 1,916.62	$ 353.36
1926	99,111	.026868	.032941	2,662.91	3,264.82	601.91
1927	100,705	.029378	.036019	2,958.51	3,627.29	668.78
January, February, March, 1928	15,875	.027312	.033486	433.58	531.59	98.01
Totals, F-446	275,664			$ 7,618.26	$ 9,340.32	$ 1,722.06
Grand Total—All Types	7,918,829			$149,205.39	$164,689.60	$ 15,484.21

SUBSTITUTE FOR PLAINTIFF'S EXHIBIT A-2.

Burden Cost of Machining Cams upon Ford Camshafts with Melling Cam Lathes and with Ford Cam Shapers, and Minimum Loss by Ford Motor Company through Use of Melling Cam Lathes from June 16, 1925 to February 3, 1931. Based on Production Per Hour Claimed or Admitted by Defendant's Witnesses for Camshafts T-410 and F-446, and Calculated Therefrom for Camshaft A-6250.

	Production	Burden Cost Per Shaft		Burden Total Cost		Burden Loss through Use of Melling Cam Lathes
		Ford Cam Shapers	Melling Cam Lathes	Ford Cam Shapers	Melling Cam Lathes	
Model T—T-410						
June 15 to December 31, 1925	1,093,205	$ .015028	$ .016275	$ 16,428.68	$ 17,791.91	$ 1,363.23
1926	1,699,205	.022370	.024227	38,011.21	41,166.64	3,155.43
1927	506,086	.026796	.029020	13,561.08	14,686.62	1,125.54
1928	120,448	.017414	.018859	2,097.48	2,271.53	174.05
January 1 to 15, 1929	1,222	.015910	.017231	19.44	21.06	1.62
Totals, T-410	3,420,166			$ 70,117.89	$ 75,937.76	$ 5,819.87
Model A—A-6250						
November and December, 1927	9,287	.028508	.031560	$ 264.76	$ 293.10	$ 28.34
1928	843,456	.019336	.021405	16,309.07	18,054.18	1,745.11
1929	1,961,973	.022584	.025001	44,309.20	49,051.29	4,742.09
1930	1,370,417	.032777	.036285	44,918.16	49,725.58	4,807.42
January 1 to February 3, 1931	37,866	.040008	.044290	1,514.94	1,677.09	162.15
Totals, A-6250	4,222,999			$107,316.13	$118,801.24	$ 11,485.11
Tractor—F-446						
June 16 to December 31, 1925	59,973	.045019	.055196	$ 2,699.92	$ 3,310.27	$ 610.35
1926	99,111	.054256	.066521	5,377.37	6,592.96	1,215.59
1927	100,705	.049817	.061078	5,016.82	6,150.86	1,134.04
January, February, March, 1928	15,875	.048070	.058936	763.11	935.61	172.50
Totals, F-446	275,664			$ 13,857.22	$ 16,989.70	$ 3,132.48
Grand Total—All Types	7,918,829			$191,291.24	$211,728.70	$ 20,437.46

SUBSTITUTE FOR PLAINTIFF'S EXHIBIT B.

Unit Costs Per Camshaft of Shaping Cams with Ford Cam Shapers Compared with Turning the Cams on Melling Cam Lathes (Including Straightening Operations) Based upon Production per Hour Claimed or Admitted by Defendant's Witnesses for Camshafts T-410 and F-446, and Calculated Therefrom for Camshaft A-6250.

	Burden Ratio to Productive Labor	Productive Labor Rate Per Hour	Burden Cost Per Hour	With Ford Cam Shapers				With Melling Lathes			
					Cost Per Camshaft				Cost Per Camshaft		
				Man Hours Per Shaft	Productive Labor	Burden	Total	Man Hours Per Shaft	Productive Labor	Burden	Total
	(1)	(2)									
Model T—T-410											
June 16 to December 31, 1925	.9227	$ .8143	$ .7514	.02000(a)	$ .016286	$ .015028	$ .031314	.02166(b)	$ .017638	$ .016275	$ .033913
1926	1.3219	.8461	1.1185	.02000	.016922	.022370	.039292	.02166	.018327	.024227	.042554
1927	1.4389	.9311	1.3398	.02000	.018622	.026796	.045418	.02166	.020168	.029020	.049188
1928	1.0586	.8225	.8707	.02000	.016450	.017414	.033864	.02166	.017815	.018859	.036674
January 1 to 15, 1929	.9357	.8502	.7955	.02000	.017004	.015910	.032914	.02166	.018415	.017231	.035646
Model A—A-6250											
November and December, 1927	1.4389	.8985	1.2929	.02205(e)	.019812	.028508	.048320	.02441(f)	.021932	.031560	.053492
1928	1.0586	.8284	.8769	.02205	.018266	.019336	.037602	.02441	.020221	.021405	.041626
1929	1.1556	.8863	1.0242	.02205	.019543	.022584	.042127	.02441	.021635	.025001	.046636
1930	1.5562	.9552	1.4865	.02205	.021062	.032777	.053839	.02441	.023316	.036285	.059601
January 1 to February 3, 1931	1.8804	.9649	1.8144	.02205	.021276	.040008	.061284	.02441	.023553	.044290	.067843
Tractor—F-446											
June 16 to December 31, 1925	1.7271	.8161	1.4095	.03194(c)	.026066	.045019	.071085	.03916(d)	.031958	.055196	.087154
1926	2.0194	.8412	1.6987	.03194	.026868	.054256	.081124	.03916	.032941	.066521	.099462
1927	1.6957	.9198	1.5597	.03194	.029378	.049817	.079195	.03916	.036019	.061078	.097097
January, February, March, 1928	1.7600	.8551	1.5050	.03194	.027312	.048070	.075382	.03916	.033486	.058936	.092422

(a) Based on production of 25 per machine hour or 50 per man hour (pp. 205, 212, 222 and 277 of printed record of appeal).

(b) Based on production of 37.5 per machine hour, or 75 per man hour (pp. 212 and 223 of printed record of appeal) plus .5 minutes for straightening (Exh. 14 of Defendant's Exh. C).

(c) Based on production of 15.65 per machine hour, or 31.30 per man hour. Calculated from (a) above, due weight being given to larger area of F-446 (See addition to Plaintiff's Exh. C).

(d) Based on production of 25 per machine hour or 50 per man hour (p. 256 of printed record of appeal) plus 1.15 minutes for straightening (See Defendant's Exh. 215).

(e) Based on production of 22.68 per machine hour or 45.35 per man hour. Calculated from (a) above, due weight being given to larger area of A-6250 (See addition to Plaintiff's Exh. C).

(f) Based on production of 34.706 per machine hour or 69.412 per man hour. Calculated from (b) above, due weight being given to the greater area of A-6250 (See Plaintiff's Exh. C) plus .60 minutes for straightening (See defendant's further statement of account Exh. C page 23, as amended).

(1) See Plaintiff's Exhibit B-1.

(2) See Plaintiff's Exhibit B-2.

ADDITION TO PLAINTIFF'S EXHIBIT C.

CALCULATIONS TO DETERMINE PRODUCTION PER HOUR OF A-6250 AND F-446 CAMSHAFTS—BASED ON SPEEDS CLAIMED OR ADMITTED BY DEFENDANT.

	Minutes Other Than Turning	Remainder—Actual Turning Minutes	Total Minutes Per Shaft	Shafts Per Machine Hour	Shafts Per Man Hour
	(C)				
Table H					
Production of T-410 camshafts on Ford cam shaper determined to be 25 per hour. Non-turning and turning time would be:					
Machine	.72	1.68	2.40	25	
Man	.36	.84	1.20		50
A-6250, non-turning time	.36				
Turning time .84 x 1.1464 (A)		.9630	1.3230	22.68	45.35
Table I					
Production of T-410 camshafts on Ford cam shaper determined to be 25 per hour. Non-turning and turning time would be:					
Machine	.72	1.68	2.40	25	
Man	.36	.84	1.20		50
F-446, non-turning time	.36				
Turning time .84 x 1.85287 (A)		1.5564	1.9164	15.65	31.30

EXHIBIT 302.

SUBSTITUTE PAGES OF PLAINTIFF'S STATEMENT OF ACCOUNT.

Changes made:

1. Substitution of the Ford cam shaper as the standard of comparison in place of the Landis grinder for computing A-6250 and F-446 costs.

2. Inclusion of the straightening operation in the computations of the costs of machining on Melling cam lathe for all three types of shafts.

3. Substitution of production of 35 Model T-410 camshafts per machine hour on the Melling cam lathe in place of 37.5 per hour.

4. Substitution of production of 30 Model A-6250 camshafts per machine hour on the Melling cam lathe in place of 34.706 per hour.

5. Substitution of production of 14.27 Model F-446 camshafts per machine hour on Melling cam lathe in place of 25 per hour.

6. Substitution of the Pioch cam mill as the standard of comparison in place of the Landis grinder for computing additional losses "based upon rejection of claims made by defendant, but not substantiated by records supplied."

NOTE: The reproduction herein of certain text copied exactly from Plaintiff's Exhibit Z is not to be taken as an admission of the correctness thereof.

LOSSES SUSTAINED BY FORD MOTOR COMPANY THROUGH USE OF MELLING CAM LATHES FOR ROUGH TURNING CAMS OF CAMSHAFTS T-410, A-6250 AND F-446 FROM JUNE 16, 1925 TO DATE USE OF THESE MACHINES WAS ABANDONED.

MINIMUM **LOSS*** from June 16, 1925 to February 3, 1931 based upon production per hour determined from records of the defendant		$64,124.08*
ADDITIONAL LOSSES "BASED UPON REJECTION OF CLAIMS MADE BY DEFENDANT, BUT NOT SUBSTANTIATED BY RECORDS SUPPLIED"		
"Production by Pioch machines from May 16, 1930 to February 3, 1931, claimed by defendant but not substantiated by records supplied" (Note A):		
May 16, 1930 to December 31, 1930—105,168 A-6250 camshafts at $.011647 (Minimum loss per shaft during this period)	$ 1,224.89	
January 1, 1931 to February 3, 1931—36,960 A-6250 camshafts at $.013257 (Minimum loss per shaft during this period)	489.98	
		1,714.87
"Production by Pioch machines, from February 4, 1931 to July 31, 1931, claimed by defendant but not substantiated by records supplied."		
"Sufficient Melling cam lathes to have rough turned the cams upon the entire production of camshafts during this period were apparently available for use, the records supplied by defendant not having established their abandonment for this purpose."		
435,157 A-6250 camshafts at $.013257		5,768.88
Total **Loss** "Based Upon Positive Records and Upon Rejection of Unsubstantiated Claims by Defendant"		$71,607.83

Note A: (The Pioch machine was available beginning May 16, 1930 and is therefore the correct standard of comparison instead of the Landis grinder):

	1930	*1931*
Cost per shaft using Melling cam lathe, excluding straightening operations	$ .040703	$ .046331
Cost per shaft using Pioch mill with a production of 42 shafts per hour	.029056	.033074
Loss by using Melling cam lathe	$ .011647	$ .013257

* PRINTER'S NOTE: Losses appear in red on original and have been reproduced in boldface type.

SUBSTITUTE FOR PLAINTIFF'S EXHIBIT A.

Cost of Machining Cams upon Ford Camshafts with Melling Cam Lathes (Including Straightening Operation) and with Ford Cam Shapers, and Minimum Loss by Ford Motor Company through Use of Melling Cam Lathes from June 16, 1925 to February 3, 1931. Based upon Production Per Hour Determined from Records of the Defendant.

	Production	Cost Per Shaft		Total Cost		Loss through Use of Melling Cam Lathes
		Ford Cam Shapers	Melling Cam Lathes	Ford Cam Shapers	Melling Cam Lathes	
Model T—T-410						
June 16 to December 31, 1925	1,093,205	$ .031314	$ .035416	$ 34,232.62	$ 38,716.95	$ 4,484.33
1926	1,699,205	.039292	.044439	66,765.17	75,510.97	8,745.80
1927	506,086	.045418	.051367	22,985.41	25,996.12	3,010.71
1928	120,448	.033864	.038300	4,078.85	4,613.15	534.30
January 1 to 15, 1929	1,222	.032914	.038026	40.22	46.47	6.25
Totals, T-410	3,420,166			$128,102.27	$144,883.66	$ 16,781.39
Model A—A-6250						
November and December, 1927	9,287	.050249	.058444	$ 466.66	$ 542.77	$ 76.11
1928	843,456	.039102	.045480	32,980.82	38,360.38	5,379.56
1929	1,961,973	.043808	.050953	85,950.11	99,968.41	14,018.30
1930	1,370,417	.055988	.065120	76,726.90	89,241.55	12,514.65
January 1 to February 3, 1931	37,866	.063729	.074124	2,413.16	2,806.78	393.62
Totals, A-6250	4,222,999			$198,537.65	$230,919.89	$ 32,382.24
Tractor—F-446						
June 16 to December 31, 1925	59,973	.071085	.120605	$ 4,263.18	$ 7,233.04	$ 2,969.86
1926	99,111	.081124	.137638	8,040.28	13,641.44	5,601.16
1927	100,705	.079195	.134364	7,975.33	13,531.13	5,555.80
January, February, March, 1928	15,875	.075382	.127894	1,196.69	2,030.32	833.63
Totals, F-446	275,664			$ 21,475.48	$ 36,435.93	$ 14,960.45
Grand Total—All Types	7,918,829			$348,115.40	$412,239.48	$ 64,124.08

1625

SUBSTITUTE FOR PLAINTIFF'S EXHIBIT A-1.

Productive Labor Cost of Machining Cams upon Ford Camshafts with Melling Cam Lathes (Including Straightening Operation) and with Ford Cam Shapers, and Minimum Labor Loss by Ford Motor Company through Use of Melling Cam Lathes from June 16, 1925 to February 3, 1931. Based upon Production Per Hour Determined from Records of the Defendant.

	Production	Productive Labor Cost Per Shaft		Total Productive Labor Cost		Productive Labor Loss through Use of Melling Cam Lathes
		Ford Cam Shapers	Melling Cam Lathes	Ford Cam Shapers	Melling Cam Lathes	
Model T—T-410						
June 16 to December 31, 1925	1,093,205	$ .016286	$ .018419	$ 17,803.94	$ 20,135.74	$ 2,331.80
1926	1,699,205	.016922	.019139	28,753.95	32,521.08	3,767.13
1927	506,086	.018622	.021061	9,424.33	10,658.68	1,234.35
1928	120,448	.016450	.018605	1,981.37	2,240.93	259.56
January 1 to 15, 1929	1,222	.017004	.019232	20.78	23.50	2.72
Totals, T-410	3,420,166			$ 57,984.37	$ 65,579.93	$ 7,595.56
Model A—A-6250						
November and December, 1927	9,287	.020603	.023963	$ 191.34	$ 222.54	$ 31.20
1928	843,456	.018995	.022093	16,021.45	18,634.47	2,613.02
1929	1,961,973	.020323	.023638	39,873.17	46,377.12	6,503.95
1930	1,370,417	.021903	.025475	30,016.24	34,911.37	4,895.13
January 1 to February 3, 1931	37,866	.022125	.025734	837.78	974.44	136.66
Totals, A-6250	4,222,999			$ 86,939.98	$101,119.94	$ 14,179.96
Tractor—F-446						
June 16 to December 31, 1925	59,973	.026066	.044224	$ 1,563.26	$ 2,652.24	$ 1,088.98
1926	99,111	.026868	.045585	2,662.91	4,517.97	1,855.06
1927	100,705	.029378	.049844	2,958.51	5,019.54	2,061.03
January, February, March, 1928	15,875	.027312	.046338	433.58	735.62	302.04
Totals, F-446	275,664			$ 7,618.26	$ 12,925.37	$ 5,307.11
Grand Totals—All Types	7,918,829			$152,542.61	$179,625.24	$ 27,082.63

1625

SUBSTITUTE FOR PLAINTIFF'S EXHIBIT A-2.

Burden Cost of Machining Cams upon Ford Camshafts with Melling Cam Lathes (Including Straightening Operation) and with Ford Cam Shapers, and Minimum Burden Loss by Ford Motor Company through Use of Melling Cam Lathes from June 16, 1925 to February 3, 1931. Based upon Production Per Hour Determined from Records of the Defendant.

	Production	Burden Cost Per Shaft		Total Burden Cost		Burden Loss through Use of Melling Cam Lathes
		Ford Cam Shapers	Melling Cam Lathes	Ford Cam Shapers	Melling Cam Lathes	
Model T—T-410						
June 16 to December 31, 1925	1,093,205	$ .015028	$ .016997	$ 16,428.68	$ 18,581.21	$ 2,152.53
1926	1,699,205	.022370	.025300	38,011.22	42,989.89	4,978.67
1927	506,086	.026796	.030306	13,561.08	15,337.44	1,776.36
1928	120,448	.017414	.019695	2,097.48	2,372.22	274.74
January 1 to 15, 1929	1,222	.015910	.018794	19.44	22.97	3.53
Totals, T-410	3,420,166			$ 70,117.90	$ 79,303.73	$ 9,185.83
Model A—A-6250						
November and December, 1927	9,287	.029646	.034481	$ 275.32	$ 320.23	$ 44.91
1928	843,456	.020107	.023387	16,959.37	19,725.91	2,766.54
1929	1,961,973	.023485	.027315	46,076.94	53,591.29	7,514.35
1930	1,370,417	.034085	.039645	46,710.66	54,330.18	7,619.52
January 1 to February 3, 1931	37,866	.041604	.048390	1,575.38	1,832.34	256.96
Totals, A-6250	4,222,999			$111,597.67	$129,799.95	$ 18,202.28
Tractor—F-446						
June 16 to December 31, 1925	59,973	.045019	.076381	$ 2,699.92	$ 4,580.80	$ 1,880.88
1926	99,111	.054256	.092053	5,377.37	9,123.47	3,746.10
1927	100,705	.049817	.084520	5,016.82	8,511.59	3,494.77
January, February, March, 1928	15,875	.048070	.081556	763.11	1,294.70	531.59
Totals, F-446	275,664			$ 13,857.22	$ 23,510.56	$ 9,653.34
Grand Total—All Types	7,918,829			$195,572.79	$232,614.24	$ 37,041.45

1627

SUBSTITUTE FOR PLAINTIFF'S EXHIBIT B.

Unit Costs Per Camshaft of Shaping Cams with Ford Cam Shapers Compared with Turning the Cams on Melling Cam Lathes (Including Straightening Operation). Based upon Production Per Hour Determined from Records of the Defendant for Camshafts T-410, A-6250 and F-446.

	Burden Ratio to Productive Labor	Productive Labor Rate Per Hour	Burden Cost Per Hour	With Ford Cam Shapers				With Melling Lathes			
				Man Hours Per Shaft	Cost Per Camshaft			Man Hours Per Shaft	Cost Per Camshaft		
					Productive Labor	Burden	Total		Productive Labor	Burden	Total
Model T—T-410	(1)	(2)									
June 16 to December 31, 1925	.9227	$ .8143	$ .7514	.02000(a)	$ .016286	$ .015028	$ .031314	.02262(b)	$ .018419	$ .016997	$ .035416
1926	1.3219	.8461	1.1185	.02000	.016922	.022370	.039292	.02262	.019139	.025300	.044439
1927	1.4389	.9311	1.3398	.02000	.018622	.026796	.045418	.02262	.021061	.030306	.051367
1928	1.0586	.8225	.8707	.02000	.016450	.017414	.033864	.02262	.018605	.019695	.038300
January 1 to 15, 1929	.9357	.8502	.7955	.02000	.017004	.015910	.032914	.02262	.019232	.018794	.038026
Model A—A-6250											
November and December, 1927	1.4389	.8985	1.2929	.02293(e)	.020603	.029646	.050249	.02667(f)	.023963	.034481	.058444
1928	1.0586	.8284	.8769	.02293	.018995	.020107	.039102	.02667	.022093	.023387	.045480
1929	1.1556	.8863	1.0242	.02293	.020323	.023485	.043808	.02667	.023638	.027315	.050953
1930	1.5562	.9552	1.4865	.02293	.021903	.034085	.055988	.02667	.025475	.039645	.065120
January 1 to February 3, 1931	1.8804	.9649	1.8144	.02293	.022125	.041604	.063729	.02667	.025734	.048390	.074124
Tractor—F-446											
June 16 to December 31, 1925	1.7271	.8161	1.4095	.03194(c)	.026066	.045019	.071085	.05419(d)	.044224	.076381	.120605
1926	2.0194	.8412	1.6987	.03194	.026868	.054256	.081124	.05419	.045585	.092053	.137638
1927	1.6957	.9198	1.5597	.03194	.029378	.049817	.079195	.05419	.049844	.084520	.134364
January, February, March, 1928	1.7600	.8551	1.5050	.03194	.027312	.048070	.075382	.05419	.046338	.081556	.127894

(a) Based on production of 25 per machine hour or 50 per man hour (See Exh. 13 of Defendant's Further Statement of Account).

(b) Based on production of 35 per machine hour or 70 per man hour plus .5 minutes for straightening operation (See Exh. 14 of Defendant's Further Statement of Account and the H. E. Payne report).

(c) Based on production of 15.65 per machine hour or 31.30 per man hour (Calculated from (a) above, due weight being given to larger area of F-446. See addition to Plaintiff's Exhibit C).

(d) Based on production of 14.27 per machine hour or 28.54 per man hour plus 1.15 minutes for straightening operation (See Defendant's Exhibit 215).

(e) Based on production of 21.81 per machine hour or 43.62 per man hour (See Defendant's Further Statement of Account page 23 as amended).

(f) Based on production of 30 per machine hour or 60 per man hour plus .60 minutes for straightening (See Defendant's Further Statement of Account page 23 as amended).

(1) See Plaintiff's Exhibit B-1.

(2) See Plaintiff's Exhibit B-2.

ADDITION TO PLAINTIFF'S EXHIBIT C.

CALCULATIONS TO DETERMINE PRODUCTION PER HOUR OF A-5260 AND F-446 CAMSHAFTS—BASED ON SPEEDS CLAIMED OR ADMITTED BY DEFENDANT.

	Minutes Other Than Turning	Remainder—Actual Turning Minutes	Total Minutes Per Shaft	Shafts Per Machine Hour	Shafts Per Man Hour
	(C)				
Table H					
Production of T-410 camshafts on Ford cam shaper determined to be 25 per hour. Non-turning and turning time would be:					
Machine	.72	1.68	2.40	25	
Man	.36	.84	1.20		50
A-6250, non-turning time	.36				
Turning time .84 x 1.1464 (A)		.9630	1.3230	22.68	45.35
Table I					
Production of T-410 camshafts on Ford cam shaper determined to be 25 per hour. Non-turning and turning time would be:					
Machine	.72	1.68	2.40	25	
Man	.36	.84	1.20		50
F-446, non-turning time	.36				
Turning time .84 x 1.85287 (A)		1.5564	1.9164	15.65	31.30

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Parts Price List

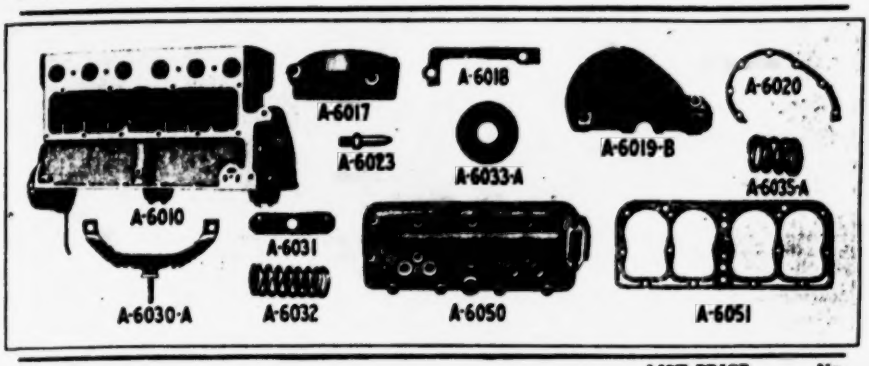
MODEL "A" and "A A"

Effective February 1, 1931

Ford Motor Company

304
sheet 1

DEFENDANT'S EXHIBIT NO. 304



Part No.	Name of Part	Year	LIST PRICE Lots of 10 per lot	LIST PRICE Lots of 100 per lot	LIST PRICE Each	No. Req. per Car
A-5563-A	Rear spring leaf No. 1	1928-31	With A-5560-A-B-C		$1 05	1
A-5563-B	Rear spring leaf No. 1	1928-31	With A-5560-D-E		1 20	1
A-5565-A	Rear spring leaf No. 2	1928-31	With A-5560-A-B-C-D		75	1
A-5565-B	Rear spring leaf No. 2	1928-31	With A-5560-E		90	1
A-5566	Rear spring leaf No. 3	1928-31	With A-5560-A-B-C-D-E		65	1
A-5567-A	Rear spring leaf No. 4	1928-31	With A-5560-A-B-D-E		55	1
A-5567-B	Rear spring leaf No. 4	1928-31	With A-5560-C		45	1
A-5568-A	Rear spring leaf No. 5	1928-31	With A-5560-A-B-C		40	1
A-5568-B	Rear spring leaf No. 5	1928-31	With A-5560-D-E		45	1
A-5569-A	Rear spring leaf No. 6	1928-31	With A-5560-A-B-C		35	1
A-5569-B	Rear spring leaf No. 6	1928-31	With A-5560-D-E		40	1
A-5570-A	Rear spring leaf No. 7	1928-31	With A-5560-A-D		30	1
A-5570-B	Rear spring leaf No. 7	1928-31	With A-5560-C		30	1
A-5570-C	Rear spring leaf No. 7	1928-31	With A-5560-E		30	1
A-5571	Rear spring leaf No. 7	1928-31	With A-5560-B		25	1
	Rear spring leaf No. 8	1928-31	Order A-5571 with A-5560-A-D-E		25	1
	Rear spring leaf No. 8	1928-31	Order A-5573 with A-5560-B		20	1
A-5572	Rear spring leaf No. 9	1928-31	With A-5560-A-D-E		20	1
A-5573	Rear spring leaf No. 10	1928-31	With A-5560-A-D-E		20	1
A-5585	Rear spring dummy leaf (used with A-5560-C)	1928-31			15	1
	Rear spring bushing	1928-31	Order A-4020		04	3
	Rear spring tie bolt	1928-31	Order A-20927 with A-5560-B-C $0 25	$2 00	03	1
	Rear spring tie bolt	1928-31	Order A-20942 with A-5560-D-E 1 35		02	1
	Rear spring tie bolt	1928-31	Order A-20920 with A-5560-A		02	1
	Rear spring tie bolt nut	1928-31	Order A-21769		01	1
A-5705	Rear spring clip	1928-31			20	1
A-5708	Rear spring clip bar, ⅜" thick	1928-31			15	2
A-5709	Rear spring clip bar, ½" thick	1928-31			20	2
	Rear spring clip nut	1928-31	Order A-21870 35	3 00	05	4
	Rear spring clip cotter	1928-31	Order A-23500 gr. 20	M 50 dz.	03	4
A-5710	Rear spring clip bar, ⅝" thick	1928-31			15	2
A-5715	Rear spring hanger	1928-31			30	2
	Rear spring hanger bar	1928-31	Order A-5448		05	2
	Rear spring hanger nut	1928-31	Order A-21794		03	4
	Rear spring hanger cotter	1928-31	Order A-23531 gr. 20	M 50 dz.	03	4
	Rear spring lubricator fitting	1928-31	Order A-24094-S7	*	10	4
A-5724-A	Rear spring clamp	1928-31			05	2
	Rear spring clamp bolt	1928-31	Order A-20546 08		01	3
	Rear spring clamp bolt nut	1928-31	Order A-21663-S2	75	01	3
A-5724-C	Spring clamp—Use with A-5560-D and E	1928-31			05	2

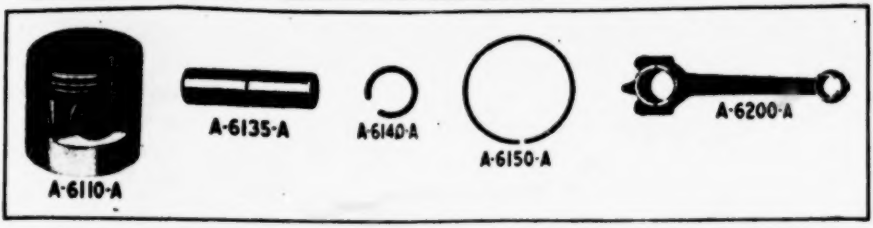
ENGINE

CYLINDER

A-6005	ENGINE ASSEMBLY less clutch and transmission	1928-31			*120 00	1
A-6010	CYLINDER	1928-31			*22 00	1
	Cylinder oil hole plug	1928-31	Order A-24486 15		02	1
	Cylinder head stud—5¼"	1928-31	Order A-24082		08	2
	Cylinder head stud—4⅞"	1928-29	Order A-24051-AR		05	3
	Cylinder head stud—4⅞"	1928-29	Order A-24051-BR 20		04	1
	Cylinder head stud—3¼"	1928-31	Order A-24051-C 40		05	1
	Cylinder head stud—3½"	1928-31	Order A-20830		05	9
	Cylinder head nut	1928-31	Order A-21780-S8 35		04	16
	Exhaust and intake manifold stud	1928-31	Order A-24052		04	4
	Manifold stud nut	1928-31	Order A-21780-S9 35		04	1
	Manifold clamp	1928-31	Order A-9443		04	4

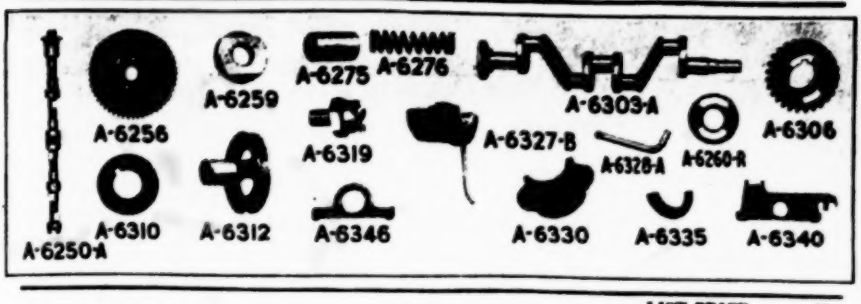
*Not subject to regular discount.

304
sheet 2

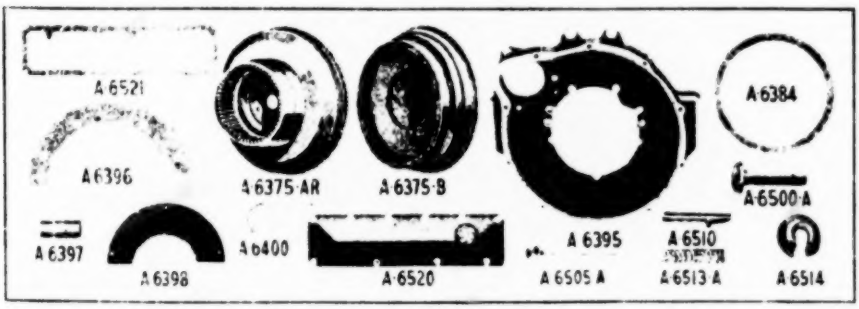


Part No.	Name of Part	Year	LIST PRICE Lots of 10 per lot	LIST PRICE Lots of 100 per lot	LIST PRICE Each	No. Req. per Car
	Manifold gland	1928-31	Order A-9440		$0 01	6
	Manifold gasket	1928-31	Order A-9448-A		05	6
A-6017	Cylinder timing gear cover side	1928-31			50	1
A-6018	Cylinder timing gear cover gasket	1928-31			01	1
	Timing gear cover to cylinder bolt —long	1928-31	Order A-21111	$0 30	04	1
	Timing gear cover to cylinder bolt —short	1928-31	Order A-21120-S2		03	1
A-6019-B	Cylinder front cover	1928-31			1 25	1
A-6020	Cylinder front cover gasket	1928-31			01	1
	Cylinder front cover bolt	1928-31	Order A-20902-S2		02	6
	Front cover bolt lock washer	1928-31	Order A-22245	$0 50	01	6
	Front support to frame bolt	1928-29	Order A-21220		02	2
	Front support to frame bolt lock washer	1928-29	Order A-22330		01	2
	Front cover packing	1928-29	Order A-6700		06	1
A-6023	Timing pin	1928-31			03	1
A-6030-A	ENGINE FRONT SUPPORT	1928-31			75	1
A-6031	Engine front support auxiliary spring	1928-31			10	1
A-6032	Engine front support spring	1928-31			03	2
A-6033-A	Engine front support stop washer	1928-31			01	1
A-6035-A	Engine front support retaining spring	1928-31			02	1
	Engine front support screw	1928-31	Order A-21240		04	2
	Engine front support screw washer	1928-31	Order A-22340		01	2
	Engine front support nut	1928-31	Order A-21791-S3		04	1
	Engine front support washer	1928-31	Order A-22423		01	1
	Engine front support nut cotter	1928-31	Order A-23531 gr. 20 M 50		dz. 03	1
A-6050-A	CYLINDER HEAD	1928-31			4 75	1
A-6051-A	Cylinder head gasket	1928-31			08	1
PISTON AND CONNECTING ROD						
A-6110-A	PISTON	1928-31			1 75	4
A-6110-BR	Piston—.005" O. S.	1928-31			1 75	4
A-6110-CR	Piston—.010" O. S.	1928-31			1 75	4
A-6110-ER	Piston—.020" O. S.	1928-31			1 75	4
A-6110-GR	Piston—.030" O. S.	1928-31			1 75	4
A-6135-A	Piston pin	1928-31			45	4
A-6135-BR	Piston pin—.002" O. S.	1928-31			45	4
A-6140-A	Piston pin retainer—.115" wide	1928-31			04	4
A-6140-BR	Piston pin retainer—.126" wide	1928-31			04	4
A-6150-A	Piston ring	1928-31			10	4
A-6150-BR	Piston ring—.005" O. S.	1928-31			10	
A-6150-CR	Piston ring—.010" O. S.	1928-31			10	4
A-6150-ER	Piston ring—.020" O. S.	1928-31			10	4
A-6150-GR	Piston ring—.030" O. S.	1928-31			10	4
A-6151-R	Piston control ring	1928-29			15	4
A-6152-AR	Oil control ring—$\frac{1}{8}$"	1928-30			15	4
A-6152-BR	Oil control ring—.005" O. S.	1928-30			15	
A-6152-CR	Oil control ring—.010" O. S.—$\frac{1}{8}$" wide	1928-30			15	4
A-6152-ER	Oil control ring—.020" O. S —$\frac{1}{8}$" wide	1928-30			15	4
A-6152-GR	Oil control ring—.030" O. S —$\frac{1}{8}$" wide	1928-30			15	4
A-6153-A	Oil control ring $\frac{3}{16}$" wide	1928-31			12	4
A-6153-BR	Oil control ring—.005" O. S.	1928-31			12	
A-6153-CR	Oil control ring—.010" O. S. $\frac{3}{16}$" wide	1928-31			12	4
A-6153-ER	Oil control ring—.020" O. S. $\frac{3}{16}$" wide	1928-31			12	4
A-6153-GR	Oil control ring—.030" O. S. $\frac{3}{16}$" wide	1928-31			12	4
A-6200-A	CONNECTING ROD ASSEMBLY	1928-31			2 25	4
A-6220	Connecting rod shim	1928-31			01	8
	Connecting rod nut	1928-31	Order A-21799		04	8
	Connecting rod cotter	1928-31	Order A-23531 gr. 20 M 50		dz. 03	8
CAMSHAFT AND CRANKSHAFT						
A-6250-A	CAM SHAFT	1928-31			5 00	1
A-6256	Cam shaft gear	1928-31			1 75	1
A-6259	Cam shaft nut	1928-31			15	1

304 sheet 3



Part No.	Name of Part	Year	LIST PRICE Lots of 10 per lot	LIST PRICE Lots of 100 per lot	LIST PRICE Each	No. Req. per Car
A-6260-R	Camshaft washer	1930-31			$0 05	1
A-6275	Cam shaft thrust plunger	1928-31			10	1
A-6276	Cam shaft thrust plunger spring	1928-31			02	1
A-6303-A	CRANKSHAFT	1928-31			14 00	1
A-6306	Crankshaft gear	1928-31			55	1
	Crankshaft gear key	1928-31	Order A-23903		04	1
A-6310	Crankshaft oil slinger	1928-31			03	1
A-6312	Crankshaft pulley assy.	1928-31			60	1
A-6319	Crankshaft ratchet	1928-31			25	1
*A-6327-AR	Crankshaft rear bearing cap assy.	1928-29			1 50	1
*A-6327-B	Crankshaft rear bearing cap assy.	1928-31			1 50	1
*A-6327-CR	Crankshaft rear bearing cap assy. (Undersize)	1928-31			1 50	1
	Crankshaft rear bearing bolt 3⅝" long	1928-29	Order A-21214-AR		06	2
	Crankshaft rear bearing bolt 4 1/16" long	1928-31	Order A-21214-B		07	2
	Crankshaft rear bearing bolt nut	1928-31	Order A-21841	$4 50	05	2
	Crankshaft rear bearing cotter	1928-31	Order A-23531	gr. $0 20 M 50	dz. 03	2
	Crankshaft rear bearing cap plug	1928-31	Order A-24454	60	01	1
A-6328-A	Crankshaft rear bearing oil pipe assy. (ball check type)	1928-31			25	1
A-6328-B	Crankshaft rear bearing oil pipe assy. (ball check type)	1930-31			25	1
*A-6330	Crankshaft front and center bearing cap	1928-31			55	2
	Crankshaft front and center bearing bolt	1928-31	Order A-21215	70 6 00	08	4
	Crankshaft front and center bearing bolt nut	1928-31	Order A-21841	4 50	05	4
	Crankshaft front and center bearing cotter	1928-31	Order A-23531	gr. 20 M 50	dz. 03	4
A-6335	Crankshaft rear bearing seal	1928-31			15	1
A-6340	Crankshaft rear bearing shim	1928-31			01	6
A-6346	Crankshaft front and center bearing shim	1928-31			01	12



FLYWHEEL AND VALVES

†A-6375-AR	FLYWHEEL ASSEMBLY	1928			8 75	1
A-6375-B	FLYWHEEL ASSEMBLY	1928-31			6 00	1
	Flywheel to crankshaft bolt	1928-31	Order A-21113		10	4
A-6384	Flywheel ring gear	1928-31			09	1

*Specify finished or rough babbitted. †Use with multiple disc clutch.

304 sheet 4

EXHIBIT 305.

FORD MOTOR COMPANY.

LOSS COMPUTED BY COMPARING THE OPERATIONS OF ROUGH MACHINING F-446 CAMSHAFTS ON MELLING CAM LATHES AND ON FORD CAM SHAPERS.

For the period from June 16, 1925 to March 31, 1928.

	Amounts
Direct labor costs:	
On Melling cam lathes	$12,925.31
On Ford cam shapers	7,259.33
Loss	$ 5,665.98

DESCRIPTION OF MEANS AND METHOD USED IN THIS COMPUTATION.

Direct labor costs have been computed in the same general manner that T-410 and A-6250 labor costs were computed in Defendant's Further Statement of Account, that is, by comparing the Melling cam lathe and the Ford cam shaper. The amounts for the operation of the Melling cam lathe have been determined from an operation sheet prepared by Ford Motor Company of England dated April 4, 1935, which is Defendant's Exhibit 215. The operation times used are number 9 "Straighten," 1.15 minutes, and number 13 "Turn 8 Cams," 2.1016 minutes, or a total of 3.2516 minutes per man. The minutes for the shaping operation on the Ford cam shaper, assuming that no straightening operation would be necessary, amounts to 1.8261 minutes per man. This amount is determined by applying to the shaping time of 1.20 minutes on model T-410 camshaft the increase in time that would be required to shape the F-446 camshaft on the Ford cam shaper. The increase in time was taken from Defendant's Exhibit 295, which shows that one cycle on the T-410 camshaft took 25.3 seconds while one cycle on the F-446 camshaft would take 38.5 seconds.

COMPARATIVE COSTS OF DIRECT LABOR FOR TWO OPERATIONS ON MODEL F-446 CAMSHAFTS ON FORD CAM SHAPERS AND ON MELLING CAM LATHES.

For the period from June 16, 1925 to March 31, 1928.

Periods	Ford Cam Shapers				Melling Cam Lathes		
	Production of Model F-446 Camshafts	Hours Required for Two Operations (Production multiplied by 1.8261 minutes or by .030435 hours)	Average Direct Labor Rates	Direct Labor Cost of Two Operations	Hours Required for Two Operations (Production multiplied by 3.2516 minutes or by .05419 hours)	Average Direct Labor Rates	Direct Labor Cost of Two Operations
June 16 to 30, 1925	5,242	159.54	$ .8171	$ 130.36	284.06	$ .8171	$ 232.11
July	9,681	294.64	.8318	245.08	524.61	.8318	436.37
August	9,245	281.37	.8245	231.99	500.99	.8245	413.07
September	8,745	266.15	.8143	216.73	473.89	.8143	385.89
October	9,363	284.96	.8008	228.20	507.38	.8008	406.31
November	8,825	268.59	.8046	216.11	478.23	.8046	384.78
December	8,872	270.02	.8191	221.17	480.77	.8191	393.80
January, 1926	11,995	365.07	.8204	299.50	650.01	.8204	533.27
February	12,195	371.15	.8213	304.83	660.85	.8213	542.76
March	15,092	459.33	.8305	381.47	817.84	.8305	679.22
April	10,124	308.12	.8358	257.53	548.62	.8358	458.54
May	8,823	268.53	.8317	223.34	478.12	.8317	397.65
June	9,645	293.55	.8462	248.40	522.66	.8462	442.27
July	6,554	199.47	.8498	169.51	355.16	.8498	301.81
August	6,766	205.92	.8507	175.18	366.65	.8507	311.91
September	6,552	199.41	.8594	171.37	355.05	.8594	305.13
October	4,914	149.56	.8724	130.48	266.29	.8724	232.31
November	4,830	147.00	.8924	131.18	261.74	.8924	233.58
December	1,621	49.34	.9038	44.59	87.84	.9038	79.39
January, 1927	4,636	141.10	.9178	129.50	251.22	.9178	230.57
February	7,032	214.02	.9263	198.25	381.06	.9263	352.98
March	13,510	411.18	.9366	385.11	732.11	.9366	685.69
April	9,704	295.34	.9483	280.07	525.86	.9483	498.67
May	6,944	211.34	.9529	201.39	376.30	.9529	358.58
June	7,398	225.16	.9160	206.25	400.90	.9160	367.22
July	6,531	198.77	.9137	181.62	353.91	.9137	323.37
August	9,977	303.65	.9114	276.75	540.65	.9114	492.75
September	9,737	296.35	.9067	268.70	527.65	.9067	478.42
October	9,606	292.36	.9020	263.71	520.55	.9020	469.54
November	10,380	315.91	.9001	284.35	562.49	.9001	506.30
December	5,250	159.78	.8979	143.47	284.50	.8979	255.45
January, 1928	7,795	237.24	.8920	211.62	422.41	.8920	376.79
February	5,360	163.13	.8120	132.46	290.46	.8120	235.85
March	2,720	82.78	.8342	69.06	147.40	.8342	122.96
	275,664	8,389.83		$7,259.33	14,938.23		$12,925.31

Average direct labor rates are for Department 410.

COPY BOUND VERTICALLY

1636

#306
X88
2/11/39

REQUISITION NO. 1587

REQUISITION FOR SUPPLIES

PURCHASE ORDER NO.

DEPT NO.

PURCHASING DEPARTMENT.
HARVESTER BUILDING CHICAGO, ILL.

November 20, 1919

Tractor Works

1 - Gorton Standard Cam Turning Machine, belt drive, complete with tools and equipment for forming Cam Draft 6049 T. Blue print attached. Contour drawing No. 5446 H to be sent later. To conform to specifications embodied in attached quotation Oct. 6, 1919.

RUSH Delivery all possible.

Acct. 4478 App.

APPROVED

SIGNED

DEPT

306

OVERSIZE PAGE – SEE NEXT FRAME

#306
2/11/39

REQUISITION NO T-1567

REQUISITION FOR SUPPLIES

PURCHASE ORDER NO

DEPT NO

TRACTOR DEPARTMENT.
HARVESTER BUILDING CHICAGO, ILL.

November 20, 1918

Tractor Works

1 - Gordon Standard Cam Turning Machine, belt drive, complete with tools and equipment for forming Cam Shaft 8049 T. Blue print attached. Contour drawing No. 8446 H to be sent later. To conform to specifications embodied in attached quotation Oct. 8, 1918.

RUSH Delivery all possible.

Acct. 4479 App.

APPROVED

SIGNED

DEPT

DEFENDANT'S EXHIBIT NO. 306

E 307

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T-1587

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...restor

...restor ...rks, ...ist ...wd. ... Mackrell Stre t.

...ilwaukee.
...nt cash t...rty days.

...tlem...:

...ssuming that you can give us delivery about February 1st, ...u may enter our order for the following to be shipped Prestor Works -

1 - Morton standard cam turning machine, belt drive, complete with twelve sets of tools and equipment for forming cam shaft 649-T, including master cam shaft and two work driving dogs, one steady rest, eccentric turning device, and complete set of wrenches.

...rice - fifty-...ree hundred ($5300.00) dollars.

...n entering ...r ...der you guarantee this machine to be of ...gh grade construction, having the very best of materials and workmanship, ...d further that ...e may expect to obtain eighteen (18) ...-. cam shafts per hour.

...e are ...ending print ...-. and will send you contour ...r ... ...s shortly.

Yours truly,

...-

...y to Mr Osmond - ...f f i c e

...y to Manufacturing Dept. - ...th Floor

Chas. Gordon, Inc.,

Milwaukee, Wisconsin.

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Ex 307

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Tractor

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...nt cash t...rty da/s.

...tlem...:

...ssuming that you can give us delivery about February 1st, ...u may enter our order for the following to be shipped Tractor Works -

- ...orton standard cam turning machine, belt drive, complete with twelve sets of tools and equipment for forming cam shaft 049-T, including master cam shaft and two work driving dogs, one steady rest, eccentric turning device, and complete set of wrenches.

...rice - fifty-...ree hundred ($53...) dollars.

...n entering our ...der you guarantee this machine to be of ...h grade construction, having the very best of materials and workmanship, ... further that ... may expect to obtain eighteen (18) ...-. cam shafts per hour.

...e are ...ending print ...-. and will send you contour ...r ... ...s shortly.

Yours truly,

...

...y to ...r ...d - ... f f i c e

...y to ...nufacturing Dept. - ...th floor

Chas. Gordon, Inc.,

Milwaukee, Wisconsin.

DEFENDANT'S EXHIBIT NO. 307

Tractor Works Machine No. [illegible]

268-441

INSTALLATION OF MACHINERY

[illegible] MACHINE TOOLS

Name and Description of Machine Gordon Std. Cam Turning Machine

Made by Chas. Gordon Inc. Maker's No. 104-20

Purchased from Chas. Gordon Inc. Milwaukee Wis.

Date Installed April 1920 Building 4 Main Plant Floor 2

COST
- Material $ 2412.38
- Labor 19.86
- Burden 11.88
- Total $ 2444.12

Grey Iron Fdry. No. 1—No. 2

Mall. Fdry. Twine Mill

Shop Order or Account No. 4[illegible]

P.O. 8788

J. R. Daily
Foreman

Works Manager

Works Form 71 [illegible]

[illegible] 27 1920 1-1

Cam Turning Machine arranged for Belt Drive
Master Camshaft and 2 Work Driving Dogs.

Invoice 2-16-20	$300.00
Material	88.07
Freight	[illegible]
	$412.38

DEFENDANT'S EXHIBIT NO. 308

DISPOSITION OF MACHINERY

We have this day [redacted] Machine No. [redacted]

Described as Stanton 884 Gum Dropping Machine

From Building A Floor 1 To Scrapped.

Date of Installation April 19 32 Appraisal Value $ $1,000.00

FOREMAN.

Approved J B Kelly

WORKS AUDITOR.

Watts Press Ltd. AUG 11 1937

DEFENDANT'S EXHIBIT NO. 309

1640

Oct. 28, 1924.

1,512,995

H. W. MELLING

LATHE

Filed Feb. 27 1923 3 Sheets-Sheet 1

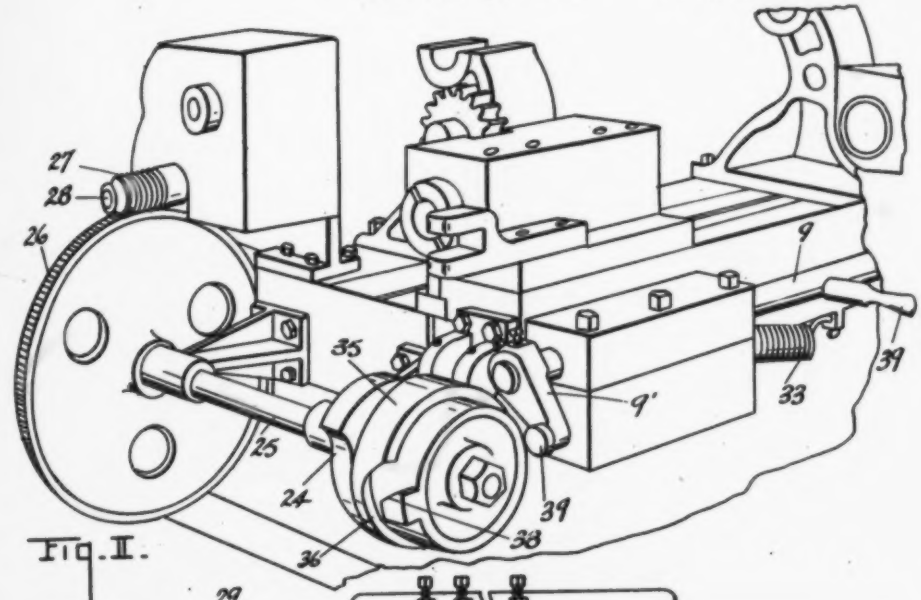


Fig. II.

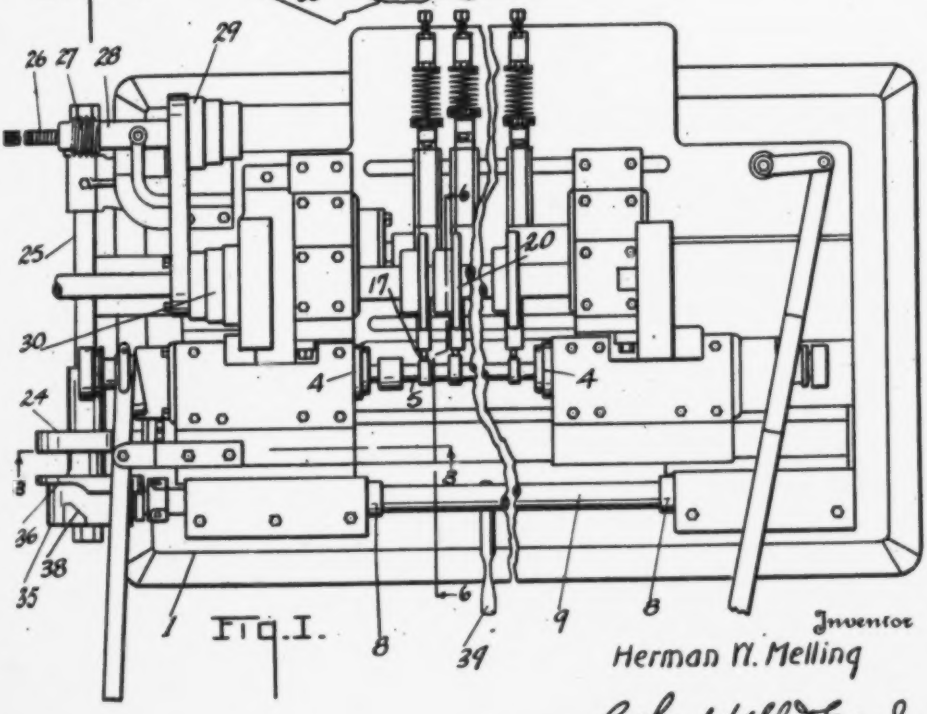


Fig. I.

Inventor

Herman W. Melling

By Chappell & Earl

Attorneys

DEFENDANT'S EXHIBIT NO. 312

DEFENDANT'S EXHIBIT NO. 312

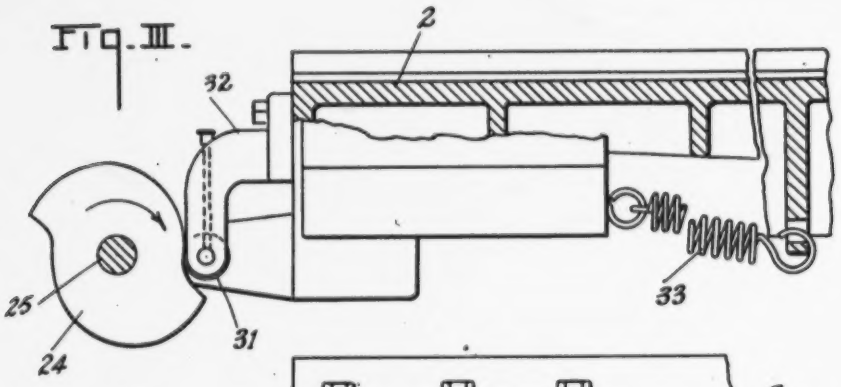
Oct. 28, 1924. 1,512,995

H. W. MELLING

LATHE

Filed Feb. 27, 1923 3 Sheets-Sheet 2

Fig. III.



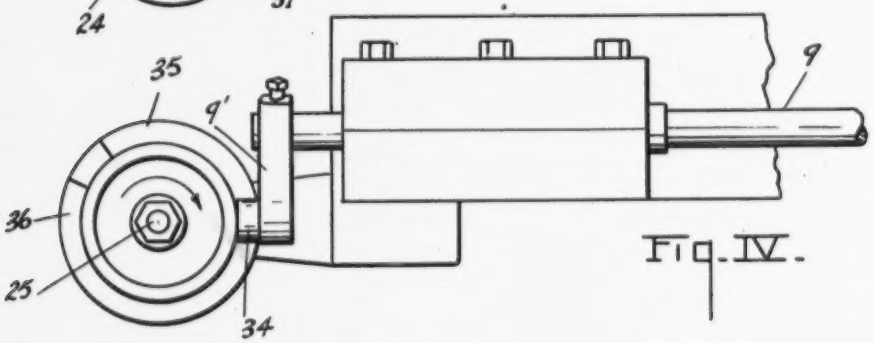


Fig. IV.

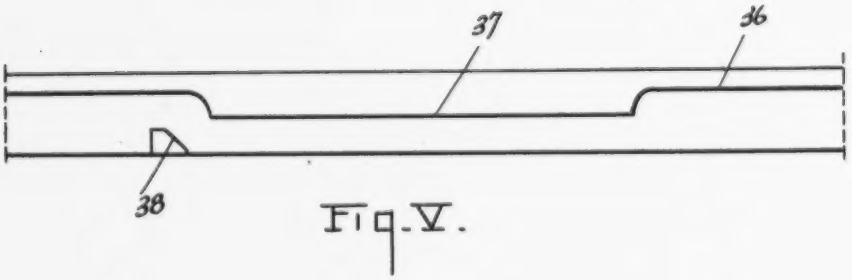


Fig. V.

Inventor
Herman W. Melling

By Chappell & Earl

Attorneys

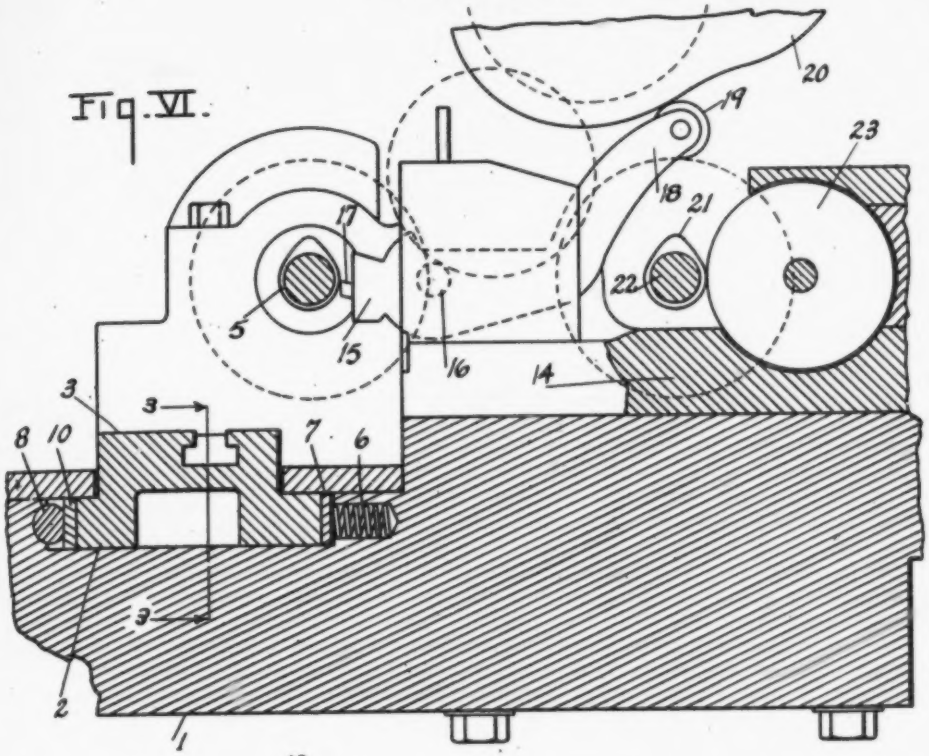
Oct. 28, 1924. 1,512,995 1642

H. W. MELLING

LATHE

Filed Feb. 27, 1923 3 Sheets-Sheet 3

Fig. VI.



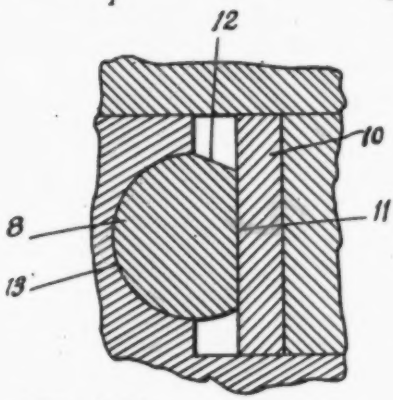


Fig. VII.

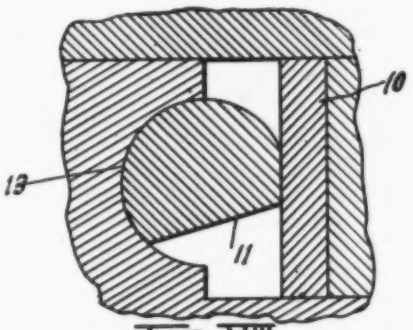


Fig. VIII.

Inventor
Herman W. Melling

By Chappell & Earl

Attorneys

Patented Oct. 28, 1924. 1,512,995

UNITED STATES PATENT OFFICE.

HERMAN W. MELLING, OF JACKSON, MICHIGAN.

LATHE.

Application filed February 27, 1923. Serial No. 621,502.

To all whom it may concern:

Be it known that I, HERMAN W. MELLING, a citizen of the United States, residing at the city and county of Jackson, State of Michigan, have invented certain new and useful Improvements in Lathes, of which the following is a specification.

This invention relates to improvements in lathes.

My improvements are especially designed by me for embodiment in lathes for turning cam shafts such as shown in my application for Letters Patent filed October 13, 1920, Serial No. 416,750 this application being in part a continuation thereof. I have illustrated and described the same herein as embodied in such machines although my improvements are readily adapted and desirable for use in machines performing other work.

The main objects of this invention are:

First, to provide an improved lathe which automatically takes a roughing and finishing cut.

Second, to provide an improved lathe embodying these advantages of taking and roughing and finishing cut which is simple and very rigid in structure so that the parts are effectively held in both positions.

Third, to provide an improved lathe in which the work carriage is laterally adjustable to regulate the depth of cut.

Further objects, and objects pertaining to details and economies of construction and operation will definitely appear from the detailed description to follow.

I accomplish the objects of my invention by the devices and means described in the following specification. The invention is clearly defined and pointed out in the claims.

A structure which is a preferred embodiment of my invention is clearly illustrated in the accompanying drawing forming a part of this application, in which;

Fig. I is a fragmentary plan view of a lathe for turning cam shafts embodying the features of my invention, parts being shown conventionally and parts broken away for convenience in illustration.

Fig. II is a fragmentary perspective view of the left front corner of the machine showing the carriage feed and adjustment.

Fig. III is a fragmentary vertical section in section on a line corresponding to line 3—3 of Figs. I and VI showing details of the carriage feed.

Fig. IV is a fragmentary front elevation view showing details of the carriage adjustment.

Fig. V is a view of the carriage adjustment cam extended.

Fig. VI is a detail vertical section on a line corresponding to the broken line 6—6 of Fig. I.

Fig. VII is an enlarged fragmentary section corresponding to that of Fig. VI showing the work carriage adjusting cam in its neutral or initial position.

Fig. VIII is a fragmentary section corresponding to that of Fig. VII showing the work carriage adjustment cam in its first or roughing cut position.

In the drawing the sectional views are taken looking in the direction of the little arrows at the ends of the section lines and similar numerals of reference refer to similar parts throughout the several views.

Referring to the drawing, the bed 1 is provided with a suitable way 2 for the work carriage 3. The work carriage is provided with suitable chucks as 4, shown conventionally, for the work 5, a valve cam shaft being shown.

The work carriage is supported for lateral adjustment to regulate the cut, see Figs. VI, VII and VIII, the main purpose of this being to provide for a roughing cut and a finishing cut so that the work may be finished without removing from the machine and without attention after it is once arranged in the chucks.

The springs 6 urge the carriage forward, wear plates 7 being interposed between the carriage and these springs, the springs being seated in recesses in the bed as shown in Fig. VI.

The carriage is adjusted against the tension of these springs by means of cams 8 on the rockshaft 9, wear or thrust plates 10 being interposed between the carriage and these cams. The cams have a flattened surface 11 which allows the carriage to return to neutral position, a face 12 which adjusts the carriage for the roughing cut and a face 13 which supports the carriage for the finish cut.

I have not in the accompanying drawing

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Patented Oct. 28, 1924. 1,512,995

UNITED STATES PATENT OFFICE.

HERMAN W. MELLING, OF JACKSON, MICHIGAN.

LATHE.

Application filed February 27, 1923. Serial No. 621,503.

To all whom it may concern:

Be it known that I, HERMAN W. MELLING, a citizen of the United States, residing at the city and county of Jackson, State of Michigan, have invented certain new and useful Improvements in Lathes, of which the following is a specification.

This invention relates to improvements in lathes.

My improvements are especially designed by me for embodiment in lathes for turning cam shafts such as shown in my application for Letters Patent filed October 13, 1920, Serial No. 416,750 this application being in part a continuation thereof. I have illustrated and described the same herein as embodied in such machines although my improvements are readily adapted and desirable for use in machines performing other work.

The main objects of this invention are:

First, to provide an improved lathe which automatically takes a roughing and finishing cut.

Second, to provide an improved lathe embodying these advantages of taking and roughing and finishing cut which is simple and very rigid in structure so that the parts are effectively held in both positions.

Third, to provide an improved lathe in which the work carriage is laterally adjustable to regulate the depth of cut.

Further objects, and objects pertaining to details and economies of construction and operation will definitely appear from the detailed description to follow.

I accomplish the objects of my invention by the devices and means described in the following specification. The invention is clearly defined and pointed out in the claims.

A structure which is a preferred embodiment of my invention is clearly illustrated in the accompanying drawing forming a part of this application, in which;

Fig. I is a fragmentary plan view of a lathe for turning cam shafts embodying the features of my invention, parts being shown conventionally and parts broken away for convenience in illustration.

Fig. II is a fragmentary perspective view of the left front corner of the machine showing details of the carriage feed and adjusting mechanism.

Fig. III is a fragmentary view partially in section on a line corresponding to line 3—3 of Figs. I and VI showing details of the carriage feed.

Fig. IV is a fragmentary front elevation view showing details of the carriage adjustment.

Fig. V is a view of the carriage adjustment cam extended.

Fig. VI is a detail vertical section on a line corresponding to the broken line 6—6 of Fig. I.

Fig. VII is an enlarged fragmentary section corresponding to that of Fig. VI showing the work carriage adjusting cam in its neutral or initial position.

Fig. VIII is a fragmentary section corresponding to that of Fig. VII showing the work carriage adjustment cam in its first or roughing cut position.

In the drawing the sectional views are taken looking in the direction of the little arrows at the ends of the section lines and similar numerals of reference refer to similar parts throughout the several views.

Referring to the drawing, the bed 1 is provided with a suitable way 2 for the work carriage 3. The work carriage is provided with suitable chucks as 4, shown conventionally, for the work 5, a valve cam shaft being shown.

The work carriage is supported for lateral adjustment to regulate the cut, see Figs. VI, VII and VIII, the main purpose of this being to provide for a roughing cut and a finishing cut so that the work may be finished without removing from the machine and without attention after it is once arranged in the chucks.

The springs 6 urge the carriage forward, wear plates 7 being interposed between the carriage and these springs, the springs being seated in recesses in the bed as shown in Fig. VI.

The carriage is adjusted against the tension of these springs by means of cams 8 on the rockshaft 9, wear or thrust plates 10 being interposed between the carriage and these cams. The cams have a flattened surface 11 which allows the carriage to return to neutral position, a face 12 which adjusts the carriage for the roughing cut and a face 13 which supports the carriage for the finish cut.

I have not in the accompanying drawing attempted to maintain the relative propor-

1644

tion of parts in these views but it will be understood that the variation between these faces should be such as to provide the desired depth of cut.

I provide a tool carriage 14 having a tool holder 15 pivoted at 16 thereon, the cutter being shown at 17. This tool holder has a rearwardly and upwardly extending arm 18 carrying a roller 19 coacting with the cam 20. The movement of the tool carriage 14 is controlled by the pattern cams 21 on the shaft 22, these pattern cams corresponding in shape to the work to be cut or being replicas of the cams to be cut.

The carriage carries an abutment roller 23, the radius of which corresponds to the radius of the tool.

With the parts thus arranged, the point of contact of the cutter with the work corresponds to the point of contact of the pattern cam with the abutment, the cams 20 and 21 coacting in shaping the work as described in my application for Letters Patent hereinbefore referred to. The work and the cams 20 and 21 are driven in synchronism, the gear connections being indicated by dotted lines in Fig. VI.

The work carriage is fed in the structure illustrated by a double cam 24 mounted on the shaft 25 which is driven from a gear 26 meshing with a worm 27 on the shaft 28 which has a set of cone pulleys 29 connected with the cone pulleys 30 connected with one of the gears shown in Fig. VI, so that the parts are suitably timed and at the same time the speed of the feed may be regulated.

The cam 24 coacts with a roller 31 on an arm 32 on the carriage 2, see Fig. III, so that two feed strokes of the carriage are provided for each rotation of the shaft 25, the spring 33 returning the carriage and holding the roller 31 firmly against the cam.

The table adjusting rock shaft 9 has an arm 9' thereon provided with a roller 34 coacting with the cam 35 on the shaft 25. This cam is shown in extended form in Fig. V, and has a portion 36 and a raised portion 37, the roller travelling on the portion 36 when the rockshaft is in the position shown in Fig. VIII, and on the raised portion 37 when the cam is in the position shown in Fig. VI or in position for the finish cut. The projection 38 insures the return of the cam, a handle 39 being provided for the rockshaft to adjust it to the neutral or work-chucking position shown in Fig. VII. As the work is chucked the lever 39 is operated to bring the rockshaft to the position shown in Fig. VIII. When the roughing cut is completed the carriage is returned and the table is adjusted laterally for the second that the number of cuts and adjustments may be increased as desired.

I have illustrated and described my improvements in an embodiment which I have found very practical in the manufacture of valve cam shafts for internal combustion engines. I have not attempted to illustrate or describe other modifications and adaptations which I contemplate as these may be very considerably varied without departing from my invention, and I believe the disclosure made will enable the adaptation or embodiment of my improvements as may be desired.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. In a structure of the class described, the combination of a work carriage mounted for lateral adjustment for determining the depth of cut, springs urging said carriage yieldingly outward, a rockshaft having cams for laterally adjusting said carriage step by step and supporting it in its adjusted positions against the thrust of said springs, a double feed cam for said carriage, a feed return spring for said carriage, an actuating cam for said rockshaft, said feed cam and actuating cam being timed so that the actuating cam is actuated at the end of the first feed stroke of the carriage, a hand lever for adjusting said rock shaft, a tool carriage movable laterally of said work carriage, a tool carried by said tool carriage, a control cam for said tool carriage, means for retaining the position of the tool relative to the work as the work revolves, and driving means for said control cam, the work and said feed and adjusting cams.

2. In a structure of the class described, the combination of a work carriage mounted for lateral adjustment for determining the depth of cut, springs urging said carriage yieldingly outward, a rockshaft having cams for laterally adjusting said carriage step by step and supporting it in its adjusted position against the thrust of said springs, a double feed cam for said carriage, a feed return spring for said carriage, an actuating cam for said rockshaft, a hand lever for adjusting said rockshaft, a tool carriage movable laterally of said work carriage, a tool carried by said tool carriage, a control cam for said tool carriage, and means for maintaining the position of the tool relative to the work as the work revolves.

3. In a structure of the class described, the combination of a work carriage mounted for lateral adjustment for determining the depth of cut, springs urging said carriage yieldingly outward, a rockshaft having cams for laterally adjusting said carriage step by step and supporting it in its adjust

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tion of parts in these views but it will be understood that the variation between these faces should be such as to provide the desired depth of cut.

I provide a tool carriage 14 having a tool holder 16 pivoted at 16' thereon, the cutter being shown at 17. This tool holder has a rearwardly and upwardly extending arm 18 carrying a roller 19 coacting with the cam 20. The movement of the tool carriage 14 is controlled by the pattern cams 21 on the shaft 22, these pattern cams corresponding in shape to the work to be cut or being replicas of the cams to be cut.

The carriage carries an abutment roller 23, the radius of which corresponds to the radius of the tool.

With the parts thus arranged, the point of contact of the cutter with the work corresponds to the point of contact of the pattern cam with the abutment, the cams 20 and 21 coacting in shaping the work as described in my application for Letters Patent hereinbefore referred to. The work and the cams 20 and 21 are driven in synchronism, the gear connections being indicated by dotted lines in Fig. VI.

The work carriage is fed in the structure illustrated by a double cam 24 mounted on the shaft 25 which is driven from a gear 26 meshing with a worm 27 on the shaft 28 which has a set of cone pulleys 29 connected with the cone pulleys 30 connected with one of the gears shown in Fig. VI, so that the parts are suitably timed and at the same time the speed of the feed may be regulated.

The cam 24 coacts with a roller 31 on an arm 32 on the carriage 2, see Fig. III, so that two feed strokes of the carriage are provided for each rotation of the shaft 25, the spring 33 returning the carriage and holding the roller 31 firmly against the cam.

The table adjusting rock shaft 9 has an arm 9' thereon provided with a roller 34 coacting with the cam 35 on the shaft 25. This cam is shown in extended form in Fig. V, and has a portion 36 and a raised portion 37, the roller travelling on the portion 36 when the rockshaft is in the position shown in Fig. VIII, and on the raised portion 37 when the cam is in the position shown in Fig. VI or in position for the finish cut. The projection 38 insures the return of the cam, a handle 39 being provided for the rockshaft to adjust it to the neutral or work-chucking position shown in Fig. VII. As the work is chucked the lever 39 is operated to bring the rockshaft to the position shown in Fig. VIII. When the roughing cut is completed the carriage is returned and the table is adjusted laterally for the second or finishing cut.

While I provide for only two cuts in this machine illustrated, it will be understood that the number of cuts and adjustments may be increased as desired.

I have illustrated and described my improvements in an embodiment which I have found very practical in the manufacture of valve cam shafts for internal combustion engines. I have not attempted to illustrate or describe other modifications and adaptations which I contemplate as these may be very considerably varied without departing from my invention, and I believe the disclosure made will enable the adaptation or embodiment of my improvements as may be desired.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. In a structure of the class described, the combination of a work carriage mounted for lateral adjustment for determining the depth of cut, springs urging said carriage yieldingly outward, a rockshaft having cams for laterally adjusting said carriage step by step and supporting it in its adjusted positions against the thrust of said springs, a double feed cam for said carriage, a feed return spring for said carriage, an actuating cam for said rockshaft, said feed cam and actuating cam being timed so that the actuating cam is actuated at the end of the first feed stroke of the carriage, a hand lever for adjusting said rock shaft, a tool carriage movable laterally of said work carriage, a tool carried by said tool carriage, a control cam for said tool carriage, means for retaining the position of the tool relative to the work as the work revolves, and driving means for said control cam, the work and said feed and adjusting cams.

2. In a structure of the class described, the combination of a work carriage mounted for lateral adjustment for determining the depth of cut, springs urging said carriage yieldingly outward, a rockshaft having cams for laterally adjusting said carriage step by step and supporting it in its adjusted position against the thrust of said springs, a double feed cam for said carriage, a feed return spring for said carriage, an actuating cam for said rockshaft, a hand lever for adjusting said rockshaft, a tool carriage movable laterally of said work carriage, a tool carried by said tool carriage, a control cam for said tool carriage, and means for maintaining the position of the tool relative to the work as the work revolves.

3. In a structure of the class described, the combination of a work carriage mounted for lateral adjustment for determining the depth of cut, springs urging said carriage yieldingly outward, a rockshaft having cams for laterally adjusting said carriage step by step and supporting it in its adjusted positions against the thrust of said springs, a feed means for said carriage providing a

plurality of feed strokes, an actuating cam for said rockshaft timed with said feed means, a tool carriage movable laterally of said work carriage, a tool carried by said tool carriage, a control means for said tool carriage, and means for maintaining the position of the tool relative to the work as the work revolves.

4. In a structure of the class described, the combination of a work carriage mounted for lateral adjustment for determining the depth of cut, a rock shaft having cams for laterally adjusting said carriage step by step, a feed means for said carriage providing a plurality of feed strokes, an actuating cam for said rock shaft timed with said feed means, a tool carriage movable laterally of said work carriage, a tool carried by said tool carriage, a control means for said tool carriage, and means for maintaining the position of the tool relative to the work as the work revolves.

5. In a structure of the class described, the combination of a work carriage mounted for lateral adjustment for determining the depth of cut, a feed means for said carriage providing a plurality of feed strokes, an actuating means for said feed adjusting means timed with said feed means, a tool carriage movable laterally of said work carriage, a tool carried by said tool carriage, a control means for said tool carriage, and means for maintaining the position of the tool relative to the work.

6. In a structure of the class described, the combination of a reciprocating tool carriage, a tool holder pivotally mounted on said tool carriage, a tool carriage control cam which is a replica of the work to be cut, a cam for oscillating said tool holder whereby the reciprocation of the tool carriage and the oscillation of the tool thereon coact in shaping the work, a work carriage reciprocating in a path at right angles to the path of the tool carriage, said work carriage being mounted for lateral adjustment to determine the depth of cut, means for laterally adjusting said work carriage, work carriage feed means comprising an automatic return means whereby successive cuts are secured, and operating connections for said carriage adjusting and feed means and feed tool carriage and tool control cams whereby the movement of the several parts is synchronized.

7. In a structure of the class described, the combination of a reciprocating tool carriage, a tool holder pivotally mounted on said tool carriage, a tool carriage control cam which is a replica of the work to be cut, a cam for oscillating said tool holder whereby the reciprocation of the tool carriage and the oscillation of the tool thereon coact in shaping the work, a work carriage reciprocating in a path at right angles to the path of the tool carriage, said work carriage being mounted for lateral adjustment to determine the depth of cut, and means for laterally adjusting said work carriage.

8. In a structure of the class described, the combination of a reciprocating tool carriage, a work carriage reciprocating in a path at right angles to the path of the tool carriage, said work carriage being mounted for lateral adjustment to determine the depth of cut, means for laterally adjusting said work carriage, work carriage feed means comprising an automatic return means whereby successive cuts are secured, and operating connections for said carriage adjusting and feed means and feed tool carriage and tool control cams whereby the movement of the several parts is synchronized.

9. In a structure of the class described, the combination of a work carriage mounted for lateral adjustment for determining the depth of cut, springs urging said carriage yieldingly outward, a rockshaft having cams for laterally adjusting said carriage step by step and supporting it in its adjusted positions against the thrust of said springs, a double feed cam for said carriage, a feed return spring for said carriage, an actuating cam for said rockshaft, said feed cam and actuating cam being mounted on the same shaft and timed so that the actuating cam is actuated at the end of the first feed stroke of the carriage, and a hand lever for adjusting said rock shaft.

10. In a structure of the class described, the combination of a work carriage mounted for lateral adjustment for determining the depth of cut, springs urging said carriage yieldingly outward, and a rockshaft having cams for laterally adjusting said carriage step by step and supporting it in its adjusted positions against the thrust of said springs.

11. In a structure of the class described, the combination of a reciprocating tool carriage, a tool holder pivotally mounted on said tool carriage, a pattern cam corresponding in shape to the shape of the work to be cut for controlling said tool carriage, said tool carriage being provided with an abutment with which said pattern cam coacts, a cam for oscillating said tool holder so that the cutting edge of the tool engages the work at a point corresponding to the point of contact of the pattern cam with its abutment, a work carriage mounted for lateral adjustment to determine the depth of cut, feed means therefor comprising a double cam and a return spring whereby successive cuts are secured, a cam for laterally adjusting said carriage, and means for simultaneously operating said tool carriage control and said tool oscillating cams and

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plurality of feed strokes, an actuating cam for said rockshaft timed with said feed means, a tool carriage movable laterally of said work carriage, a tool carried by said tool carriage, a control means for said tool carriage, and means for maintaining the position of the tool relative to the work as the work revolves.

4. In a structure of the class described, the combination of a work carriage mounted for lateral adjustment for determining the depth of cut, a rock shaft having cams for laterally adjusting said carriage step by step, a feed means for said carriage providing a plurality of feed strokes, an actuating cam for said rock shaft timed with said feed means, a tool carriage movable laterally of said work carriage, a tool carried by said tool carriage, a control means for said tool carriage, and means for maintaining the position of the tool relative to the work as the work revolves.

5. In a structure of the class described, the combination of a work carriage mounted for lateral adjustment for determining the depth of cut, a feed means for said carriage providing a plurality of feed strokes, an actuating means for said feed adjusting means timed with said feed means, a tool carriage movable laterally of said work carriage, a tool carried by said tool carriage, a control means for said tool carriage, and means for maintaining the position of the tool relative to the work.

6. In a structure of the class described, the combination of a reciprocating tool carriage, a tool holder pivotally mounted on said tool carriage, a tool carriage control cam which is a replica of the work to be cut, a cam for oscillating said tool holder whereby the reciprocation of the tool carriage and the oscillation of the tool thereon coact in shaping the work, a work carriage reciprocating in a path at right angles to the path of the tool carriage, said work carriage being mounted for lateral adjustment to determine the depth of cut, means for laterally adjusting said work carriage, work carriage feed means comprising an automatic return means whereby successive cuts are secured, and operating connections for said carriage adjusting and feed means and feed tool carriage and tool control cams whereby the movement of the several parts is synchronized.

7. In a structure of the class described, the combination of a reciprocating tool carriage, a tool holder pivotally mounted on said tool carriage, a tool carriage control cam which is a replica of the work to be cut, a cam for oscillating said tool holder whereby the reciprocation of the tool carriage and the oscillation of the tool thereon coact in shaping the work, a work carriage reciprocating in a path at right angles to the path of the tool carriage, said work carriage being mounted for lateral adjustment to determine the depth of cut, and means for laterally adjusting said work carriage.

8. In a structure of the class described, the combination of a reciprocating tool carriage, a work carriage reciprocating in a path at right angles to the path of the tool carriage, said work carriage being mounted for lateral adjustment to determine the depth of cut, means for laterally adjusting said work carriage, work carriage feed means comprising an automatic return means whereby successive cuts are secured, and operating connections for said carriage adjusting and feed means and feed tool carriage and tool control cams whereby the movement of the several parts is synchronized.

9. In a structure of the class described, the combination of a work carriage mounted for lateral adjustment for determining the depth of cut, springs urging said carriage yieldingly outward, a rockshaft having cams for laterally adjusting said carriage step by step and supporting it in its adjusted positions against the thrust of said springs, a double feed cam for said carriage, a feed return spring for said carriage, an actuating cam for said rockshaft, said feed cam and actuating cam being mounted on the same shaft and timed so that the actuating cam is actuated at the end of the first feed stroke of the carriage, and a hand lever for adjusting said rock shaft.

10. In a structure of the class described, the combination of a work carriage mounted for lateral adjustment for determining the depth of cut, springs urging said carriage yieldingly outward, and a rockshaft having cams for laterally adjusting said carriage step by step and supporting it in its adjusted positions against the thrust of said springs.

11. In a structure of the class described, the combination of a reciprocating tool carriage, a tool holder pivotally mounted on said tool carriage, a pattern cam corresponding in shape to the shape of the work to be cut for controlling said tool carriage, said tool carriage being provided with an abutment with which said pattern cam coacts, a cam for oscillating said tool holder so that the cutting edge of the tool engages the work at a point corresponding to the point of contact of the pattern cam with its abutment, a work carriage mounted for lateral adjustment to determine the depth of cut, feed means therefor comprising a double cam and a return spring whereby successive cuts are secured, a cam for laterally adjusting said carriage, and means for simultaneously operating said tool carriage control and said tool oscillating cams and

said work carriage feed and adjusting cams.

12. In a structure of the class described, the combination of a reciprocating tool carriage, a tool holder pivotally mounted on said tool carriage, a control cam for said tool carriage, a cam for oscillating said tool holder, a work carriage mounted for lateral adjustment to determine the depth of cut, feed means therefor comprising a double cam and return spring whereby successive cuts are secured, a cam for laterally adjusting said carriage, and operating connections for said several cams.

13. In a structure of the class described, the combination with a tool, of a work carriage mounted for lateral adjustment for determining the depth of cut, a spring urging said carriage yieldingly outward, a cam for laterally adjusting said carriage step by step and supporting it in its adjusted position against the thrust of said spring, and a feed means for said carriage providing a plurality of cuts.

14. In a structure of the class described, the combination with a tool, of a work carriage mounted for lateral adjustment for determining the depth of cut, a spring urging said carriage yieldingly outward, a cam for laterally adjusting said carriage step by step and supporting it in its adjusted position against the thrust of said spring, a feed cam for said carriage, a feed return spring for said carriage, and an actuating cam for said adjusting cam, said carriage, said cam and actuating cam being timed, for the purpose specified.

15. In a structure of the class described, the combination with a tool, of a work carriage mounted for lateral adjustment for determining the depth of cut, a spring urging said carriage yieldingly outward, and a cam for laterally adjusting said carriage step by step and supporting it in its adjusted position against the thrust of said spring.

16. In a structure of the class described, the combination with a tool, of a way, a work carriage mounted on said way for lateral adjustment for determining the depth of cut and for longitudinal feeding movement, means for effecting such lateral adjustment step by step, feed means for said carriage comprising automatic return means thereby providing a plurality of cuts, and operating connections for said carriage adjusting and feed means whereby the carriage is adjusted for the successive cuts.

17. In a structure of the class described, the combination with a tool, of a way, a work carriage mounted on said way for lateral adjustment for determining the depth of cut and for longitudinal feeding movement, means for effecting such lateral adjustment step by step, and feed means for said carriage comprising automatic return means thereby providing a plurality of cuts.

18. In a structure of the class described, the combination with a tool, of a way, a work carriage mounted on said way for lateral adjustment for determining the depth of cut and for longitudinal feeding movement, means for effecting such lateral adjustment, feed means for said carriage, and operating connections for said carriage adjusting and feed means whereby the carriage is automatically adjusted for the successive cuts.

19. In a structure of the class described, the combination with a tool, of a way, a work carriage mounted on said way for lateral adjustment for determining the depth of cut and for longitudinal feeding movement, means for effecting such lateral adjustment, and feed means for said carriage.

20. In a structure of the class described, the combination with a bed provided with a single carriage slideway, a carriage slidably supported on said way for lateral cut adjustment and longitudinally of said way for feeding movement, cams for laterally adjusting said carriage in said way and supporting it in its adjusted positions while permitting its feeding movement, means for automatically securing a plurality of feed strokes, and means for adjusting said cams synchronized with said feed means.

21. In a structure of the class described, the combination with a bed provided with a single carriage slideway, a carriage slidably supported on said way for lateral cut adjustment and longitudinally of said way for feeding movement, and cams for laterally adjusting said carriage in said way and supporting it in its adjusted positions while permitting its feeding movement.

22. In a structure of the class described, the combination with a bed provided with a single work carriage slideway, a tool, a carriage mounted in said way for feeding movement and for cut adjusting movement laterally of said feeding movement, means for providing a plurality of cut adjustments for said carriage and supporting it for feeding movement in its adjusted position, feed means for said carriage, and operating connections for said cut adjusting means and said carriage feed means.

23. In a structure of the class described, the combination with a bed provided with a single carriage slideway, a carriage mounted in said way for feeding movement and for cut adjusting movement laterally of said feeding movement, means for providing a plurality of cut adjustments for said carriage and supporting it for feeding movement in any of its adjusted positions, and feed means for said carriage.

24. In a structure of the class described, the combination of a carriage, a single way in which said carriage is mounted for feeding movement and for adjustment

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said work carriage feed and adjusting cams.

12. In a structure of the class described, the combination of a reciprocating tool carriage, a tool holder pivotally mounted on said tool carriage, a control cam for said tool carriage, a cam for oscillating said tool holder, a work carriage mounted for lateral adjustment to determine the depth of cut, feed means therefor comprising a double cam and return spring whereby successive cuts are secured, a cam for laterally adjusting said carriage, and operating connections for said several cams.

13. In a structure of the class described, the combination with a tool, of a work carriage mounted for lateral adjustment for determining the depth of cut, a spring urging said carriage yieldingly outward, a cam for laterally adjusting said carriage step by step and supporting it in its adjusted position against the thrust of said spring, and a feed means for said carriage providing a plurality of cuts.

14. In a structure of the class described, the combination with a tool, of a work carriage mounted for lateral adjustment for determining the depth of cut, a spring urging said carriage yieldingly outward, a cam for laterally adjusting said carriage step by step and supporting it in its adjusted position against the thrust of said spring, a feed cam for said carriage, a feed return spring for said carriage, and an actuating cam for said adjusting cam, said carriage, said cam and actuating cam being timed, for the purpose specified.

15. In a structure of the class described, the combination with a tool, of a work carriage mounted for lateral adjustment for determining the depth of cut, a spring urging said carriage yieldingly outward, and a cam for laterally adjusting said carriage step by step and supporting it in its adjusted position against the thrust of said spring.

16. In a structure of the class described, the combination with a tool, of a way, a work carriage mounted on said way for lateral adjustment for determining the depth of cut and for longitudinal feeding movement, means for effecting such lateral adjustment step by step, feed means for said carriage comprising automatic return means thereby providing a plurality of cuts, and operating connections for said carriage adjusting and feed means whereby the carriage is adjusted for the successive cuts.

17. In a structure of the class described, the combination with a tool, of a way, a work carriage mounted on said way for lateral adjustment for determining the depth of cut and for longitudinal feeding movement, means for effecting such lateral adjustment step by step, and feed means for said carriage comprising automatic return means thereby providing a plurality of cuts.

18. In a structure of the class described, the combination with a tool, of a way, a work carriage mounted on said way for lateral adjustment for determining the depth of cut and for longitudinal feeding movement, means for effecting such lateral adjustment, feed means for said carriage, and operating connections for said carriage adjusting and feed means whereby the carriage is automatically adjusted for the successive cuts.

19. In a structure of the class described, the combination with a tool, of a way, a work carriage mounted on said way for lateral adjustment for determining the depth of cut and for longitudinal feeding movement, means for effecting such lateral adjustment, and feed means for said carriage.

20. In a structure of the class described, the combination with a bed provided with a single carriage slideway, a carriage slidably supported on said way for lateral cut adjustment and longitudinally of said way for feeding movement, cams for laterally adjusting said carriage in said way and supporting it in its adjusted positions while permitting its feeding movement, means for automatically securing a plurality of feed strokes, and means for adjusting said cams synchronized with said feed means.

21. In a structure of the class described, the combination with a bed provided with a single carriage slideway, a carriage slidably supported on said way for lateral cut adjustment and longitudinally of said way for feeding movement, and cams for laterally adjusting said carriage in said way and supporting it in its adjusted positions while permitting its feeding movement.

22. In a structure of the class described, the combination with a bed provided with a single work carriage slideway, a tool, a carriage mounted in said way for feeding movement and for cut adjusting movement laterally of said feeding movement, means for providing a plurality of cut adjustments for said carriage and supporting it for feeding movement in its adjusted position, feed means for said carriage, and operating connections for said cut adjusting means and said carriage feed means.

23. In a structure of the class described, the combination with a bed provided with a single carriage slideway, a carriage mounted in said way for feeding movement and for cut adjusting movement laterally of said feeding movement, means for providing a plurality of cut adjustments for said carriage and supporting it for feeding movement in any of its adjusted positions, and feed means for said carriage.

24. In a structure of the class described, the combination of a carriage, a single way in which said carriage is mounted for feeding movement and for adjustment trans-

versely of its feeding movement to determine the depth of cut, cut adjusting means adapted to permit the feeding movement of said carriage, and carriage feed means operatively associated with said cut adjusting means.

25. In a structure of the class described, the combination of a carriage, a single way in which said carriage is mounted for feeding movement and for adjustment transversely of its feeding movement to determine the depth of cut, and cut adjusting means adapted to permit the feeding movement of said carriage and carriage feed means.

26. In a structure of the class described, the combination with a bed provided with a single work carriage slideway, a work carriage mounted on said way for longitudinally feeding movement and lateral movement to determine the depth of the cut, and a tool operatively associated with said work carriage.

27. In a structure of the class described, the combination of a carriage, and a single way in which said carriage is mounted for feeding movement and for adjustment transversely of its feeding movement to determine the depth of the cut.

In witness whereof, I have hereunto set my hand and seal.

HERMAN W. MELLING. [L. S.]

July 5, 1927.

1,634,550

H. W. MELLING

LATHE

Filed Dec. 10. 1926

3 Sheets-Sheet 1

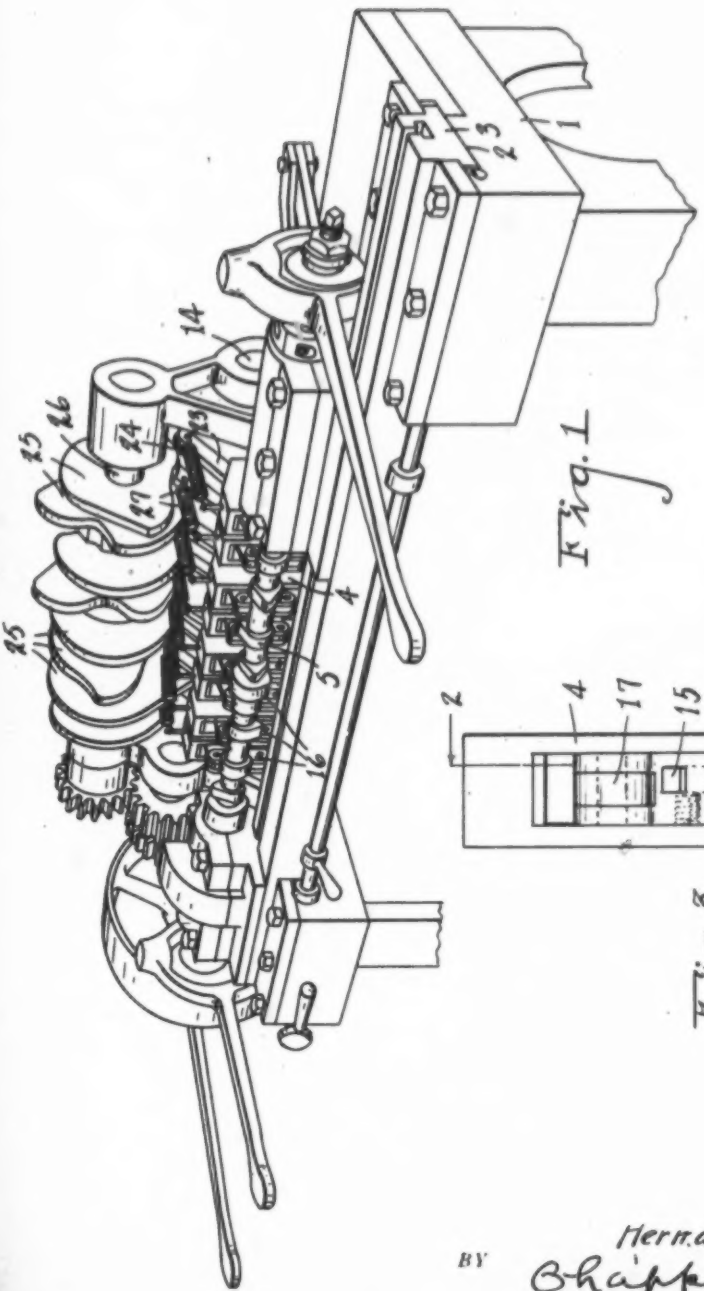

Fig. 1

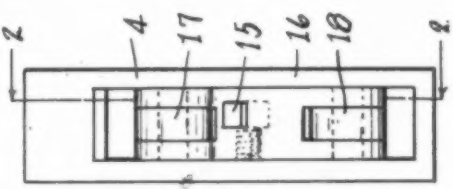

Fig. 3

INVENTOR
Herman W. Melling

BY Chappell & Earl

ATTORNEYS

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July 5, 1927. 1,634,550

H. W. MELLING

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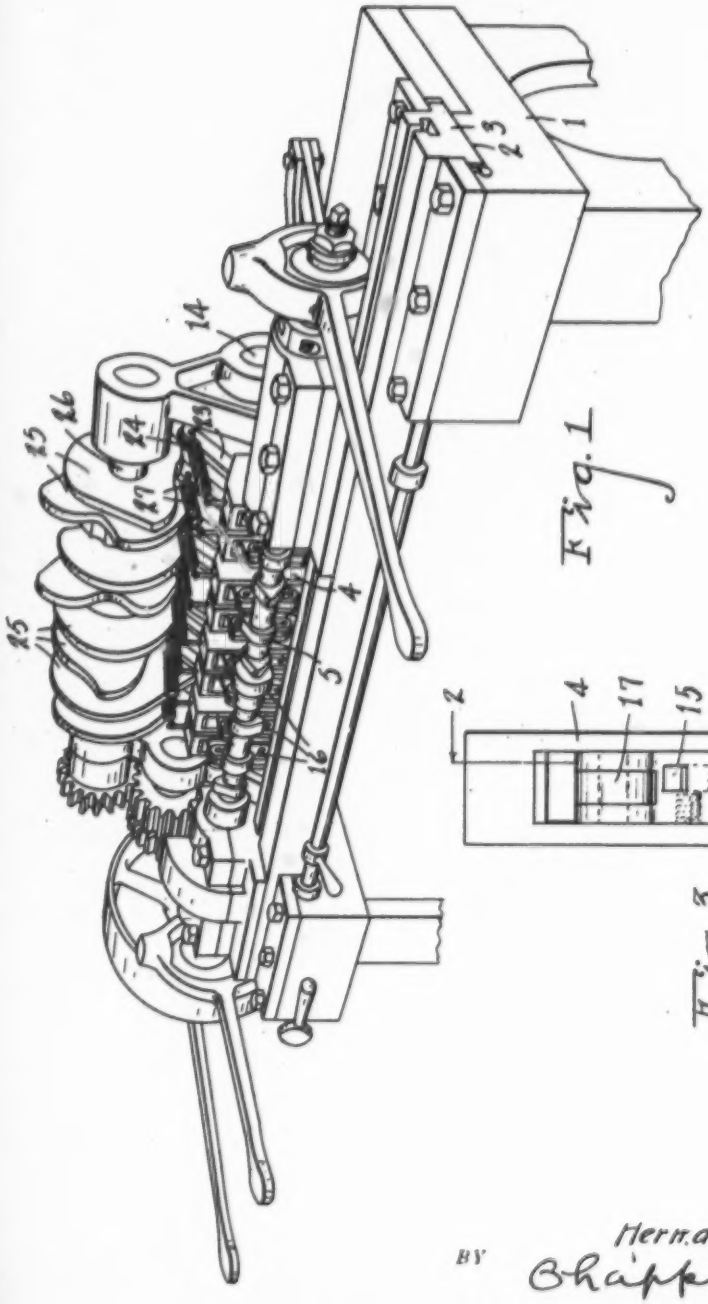

Fig. 1

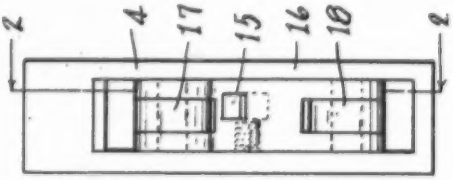

Fig. 3

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July 5, 1927. 1,634,550

H. W. MELLING

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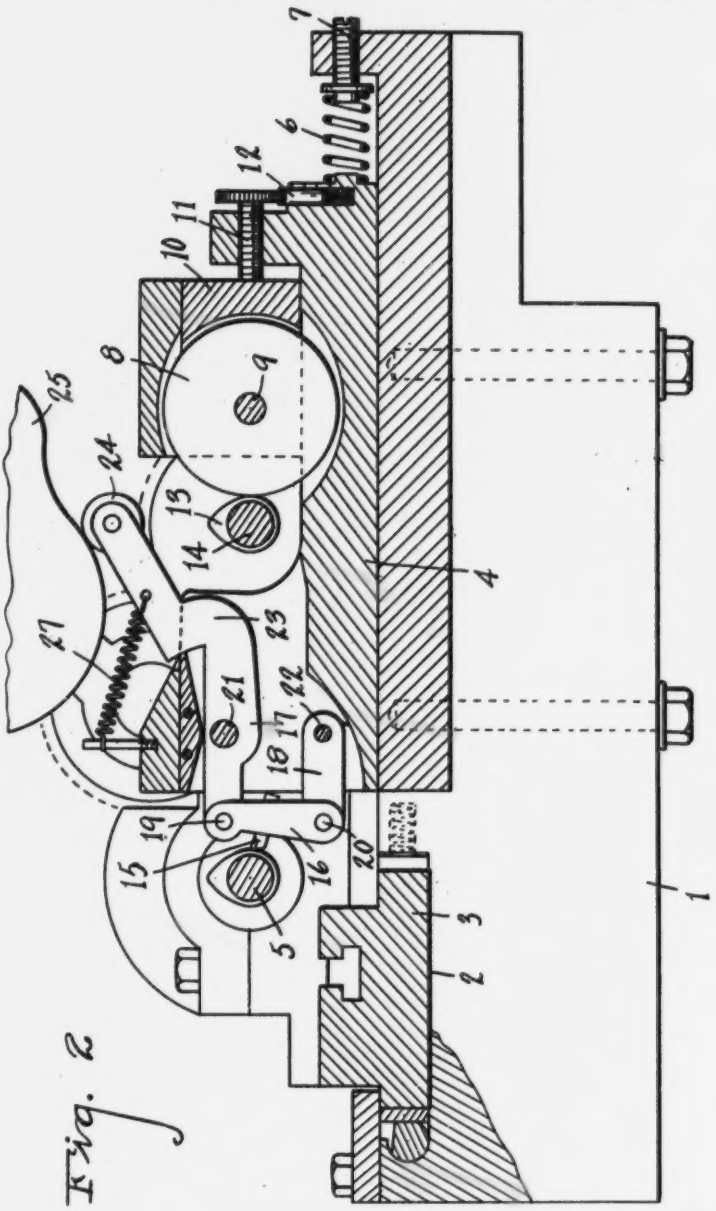

Fig. 2

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H. W. MELLING

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Fig. 4.

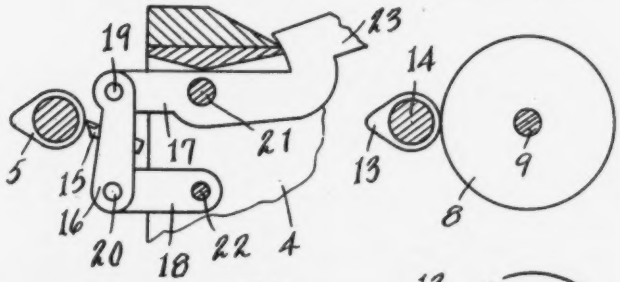


Fig. 5

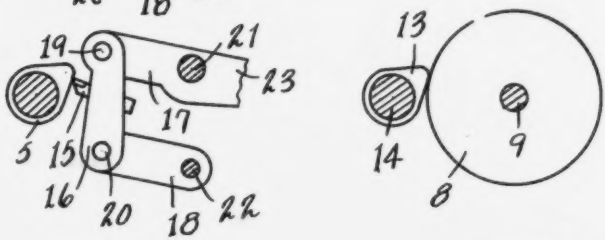


Fig. 6

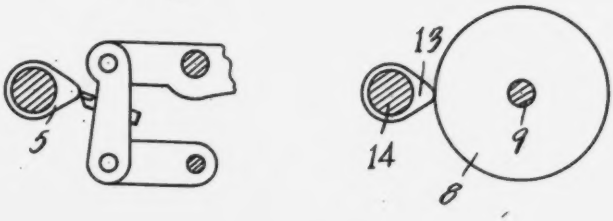


Fig. 7

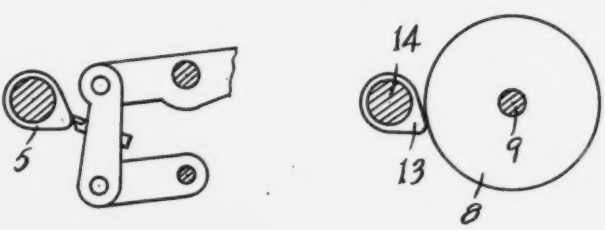
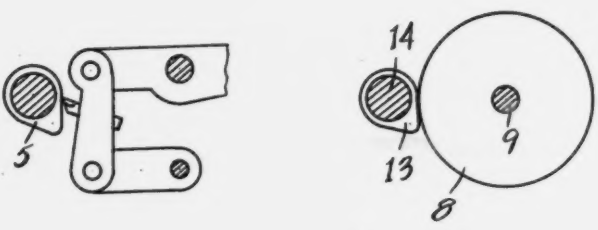


Fig. 8



INVENTOR
Herman W. Melling
BY
Chappell & Earl
ATTORNEYS

Patented July 5, 1927. 1,634,550

UNITED STATES PATENT OFFICE.

HERMAN W. MELLING, OF JACKSON, MICHIGAN.

LATHE.

Application filed December 10, 1926. Serial No. 153,855.

My improvements relate to lathes of the class illustrated in my application for Letters Patent Serial No. 416,750, filed October 13, 1920.

The main objects of this invention are:

First to provide an improved lathe for the turning of non-circular forms such as cams.

Second, to provide an improved pattern reproducing lathe by means of which non-circular forms such as cam shafts may be rapidly and accurately reproduced.

Third, to provide an improved lathe having these advantages which is of large capacity and largely automatic in its operation.

Objects pertaining to details and economies of my invention will definitely appear from the detailed description to follow. The invention is clearly defined and pointed out in the claims.

A structure embodying the features of my invention is clearly illustrated in the accompanying drawing forming a part of this application, in which:

Fig. 1 is a detail front perspective view of a structure embodying the features of my invention.

Fig. 2 is a detail view partially in transverse section on a line corresponding to line 2—2 of Fig. 3.

Fig. 3 is a front elevation of one of the tool carriages.

Figs. 4, 5, 6, 7 and 8 are detail views illustrating the relative relation of the master cam to its coacting abutment on the tool carriage and the tool to the work in several of the positions of these parts during operation thereof.

Referring to the drawing, the bed 1 of the machine is provided with a way 2 for the work carriage 3. The work carriage is mounted on this way for longitudinal and lateral movement and carries the chuck for the work, means being provided for rotating the work and for feeding the carriage. As such means form no part of my present invention and as they are described and claimed in Letters Patent No. 1,512,995, issued to me October 28, 1924, I do not illustrate or describe the same in detail herein.

The bed of the machine is also provided with ways for a plurality of tool carriages [illegible] carriage being provided for each cam to the axis of the work 5. As the carriages are duplicates a description of one will suffice.

The carriage 4 is urged toward the work by means of the spring 6, an adjusting screw 7 being provided for adjusting the tension of the spring. The carriage is provided with an abutment roller 8, the journal 9 of which is mounted on an adjustable block 10, this block being adjusted by means of the screw 11. A spring pressed detent 12 is provided for holding the screw 11 in its adjusted position.

The abutment roller coacts with the master cam 13 which is a replica in shape of the work to be cut, for instance the structure illustrated is designed for the turning of the several cams of a cam shaft for an automobile engine. The cam 13 is one of the several cams of a cam shaft 14 which may be a cam shaft taken from stock or which is a replica of the cam shaft to be reproduced.

It will be observed that the master cam 13 controlling the reciprocation of the carriage is disposed in an opposed relation to the spring 6, that is, while the spring 6 urges the carriage to the work, the master cam reciprocates the carriage against this spring, thereby preventing the tool from taking more than a cut of the desired depth; that is, the tool cannot "hog" into the work.

The tool 15 is mounted on a holder 16 for oscillating movement in a plane transverse to the axis of the work and is non-tiltable as distinguished from the pivotally mounted tool holder of my said application for Letters Patent.

The tool holder 16 is supported by parallel links 17 and 18, the tool holder being pivoted to the outer ends of the links 17 and 18 at 19 and 20, respectively. The link 17 is pivoted on the carriage at 21 while the link 18 is pivoted on the carriage at 22.

The link 17 is provided with a rearwardly and upwardly projecting arm 23 carrying a roller 24 coacting with the cam 25, there being one of the cams 25 for each unit or tool carriage. The several cams 25 are mounted on a cam shaft 26. The spring 27 holds the roller 24 against the cam.

The cam 25 is rotated in synchronism with the rotation of the master cam 13 and the work so that the tool is oscillated or reciprocated in a plane transverse to the axis of

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Patented July 5, 1927. 1,634,550

UNITED STATES PATENT OFFICE.

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LATHE.

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Second, to provide an improved pattern reproducing lathe by means of which non-circular forms such as cam shafts may be rapidly and accurately reproduced.

Third, to provide an improved lathe having these advantages which is of large capacity and largely automatic in its operation.

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Fig. 1 is a detail front perspective view of a structure embodying the features of my invention.

Fig. 2 is a detail view partially in transverse section on a line corresponding to line 2—2 of Fig. 3.

Fig. 3 is a front elevation of one of the tool carriages.

Figs. 4, 5, 6, 7 and 8 are detail views illustrating the relative relation of the master cam to its coacting abutment on the tool carriage and the tool to the work in several of the positions of these parts during operation thereof.

Referring to the drawing, the bed 1 of the machine is provided with a way 2 for the work carriage 3. The work carriage is mounted on this way for longitudinal and lateral movement and carries the chuck for the work, means being provided for rotating the work and for feeding the carriage. As such means form no part of my present invention and as they are described and claimed in Letters Patent No. 1,512,995, issued to me October 28, 1924, I do not illustrate or describe the same in detail herein.

The bed of the machine is also provided with ways for a plurality of tool carriages 4, a carriage being provided for each cam to be cut. These tool carriages 4 are mounted for reciprocating movement transversely to the axis of the work 5. As the carriages are duplicates a description of one will suffice.

The carriage 4 is urged toward the work by means of the spring 6, an adjusting screw 7 being provided for adjusting the tension of the spring. The carriage is provided with an abutment roller 8, the journal 9 of which is mounted on an adjustable block 10, this block being adjusted by means of the screw 11. A spring pressed detent 12 is provided for holding the screw 11 in its adjusted position.

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The link 17 is provided with a rearwardly and upwardly projecting arm 23 carrying a roller 24 coacting with the cam 25, there being one of the cams 25 for each unit or tool carriage. The several cams 25 are mounted on a cam shaft 26. The spring 27 holds the roller 24 against the cam.

The cam 25 is rotated in synchronism with the rotation of the master cam 13 and the work so that the tool is oscillated or reciprocated in a plane transverse to the axis of the work as the tool carriage is reciprocated. The cam 25 is so conformed that the point

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of the tool is caused to engage the work at a point corresponding to the point of contact of the master cam with the abutment roller. The links are arranged so that the radius in which the point of the tool travels corresponds to the radius of the abutment roller. The result is that work which is a replica of the pattern or master cam is produced.

In Figs. 4 to 8, inclusive, I illustrate the master cam in various positions relative to the abutment roller and also the tool in corresponding positions occupied by it. It will be observed that the point of contact of the abutment roller moves in a vertical plane as the master cam revolves. this being a plane through the axis of the abutment roller, the master cam and the work. The point of the tool is maintained in the same plane as the point of contact of the abutment roller and the work and is caused to travel or describe a path corresponding to that at the point of contact of the master cam and abutment roller, this resulting as stated in the reproduction of the pattern.

Structures embodying my improvements are of large capacity, and strong and durable, requiring a minimum of attention in operation.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. In a structure of the class described, the combination of a work carriage, means for rotatably supporting the work on said carriage, a tool carriage reciprocating laterally of said work carriage, a master cam which is a replica in shape of the work to be cut, an abutment roller on said tool carriage coacting with said cam, a tool, a tool holder, a pair of links on which said tool holder is pivotally mounted on said carriage in parallel relation, one of said links being provided with an arm, a cam coacting with said arm whereby said tool holder is oscillated in a plane transverse to the axis of the work and the cutting edge of the tool in relation to the work corresponds with the point of contact of the master cam with the abutment roller, and means for driving the work and the master cam at the same speed.

2. In a structure of the class described, the combination of a work carriage, means for rotatably supporting the work on said carriage, a tool carriage reciprocating laterally of said work carriage, a master cam which is a replica in shape of the work to be cut, an abutment coacting with said cam, a tool, a tool holder, a pair of parallel supporting links on which said tool holder is pivotally mounted, means for oscillating said links whereby said tool holder is oscillated in a plane transverse to the axis of the work and the cutting edge of the tool in relation to the work corresponds with the point of contact of the master cam with the abutment, and means for driving the work and the master cam at the same speed.

3. In a structure of the class described, the combination of means for rotatably supporting the work a tool carriage provided with a cam abutment roller, a pattern cam which is a replica in shape of the work to be cut coacting with said abutment roller to reciprocate said carriage, a tool, a tool holder, a support therefor comprising a pair of parallel links pivotally mounted on said carriage, one of said links being provided with an arm, a cam coacting with said arm whereby said tool holder is oscillated transversely to the axis of the work and so that the cutting point of the tool engages the work at a point corresponding to the point of contact of the master cam with said abutment. and means for driving the work and the pattern cam in synchronism.

4. In a structure of the class described, the combination of a rotary work holder, a reciprocating tool carriage, a master cam corresponding in shape to the work to be cut, an abutment on said carriage coacting with said master cam, a tool, a tool holder non-tiltably mounted on said carriage for reciprocating movement in a plane transverse to the axis of the work, and means for reciprocating said tool holder so that the path of travel described by the cutting edge of the tool corresponds with that at the point of contact of the master cam and abutment.

5. In a structure of the class described, the combination of a rotary work holder, a reciprocating tool carriage, a master cam corresponding in shape to the work to be cut, an abutment on said carriage with which said master cam coacts, a tool, a non-tiltable tool holder mounted on said carriage for oscillating movement in a plane transverse to the plane of movement of the tool carriage, means for reciprocating said tool holder timed with the rotation of said master cam and so that the path described by the point of the tool corresponds with that of the point of contact of the master cam with the abutment, and means for rotating the work and the master cam in synchronism.

In witness whereof I have hereunto set my hand.

HERMAN W. MELLING.

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June 16, 1925. 1,542,803

C. GORDON ET AL

LATHE

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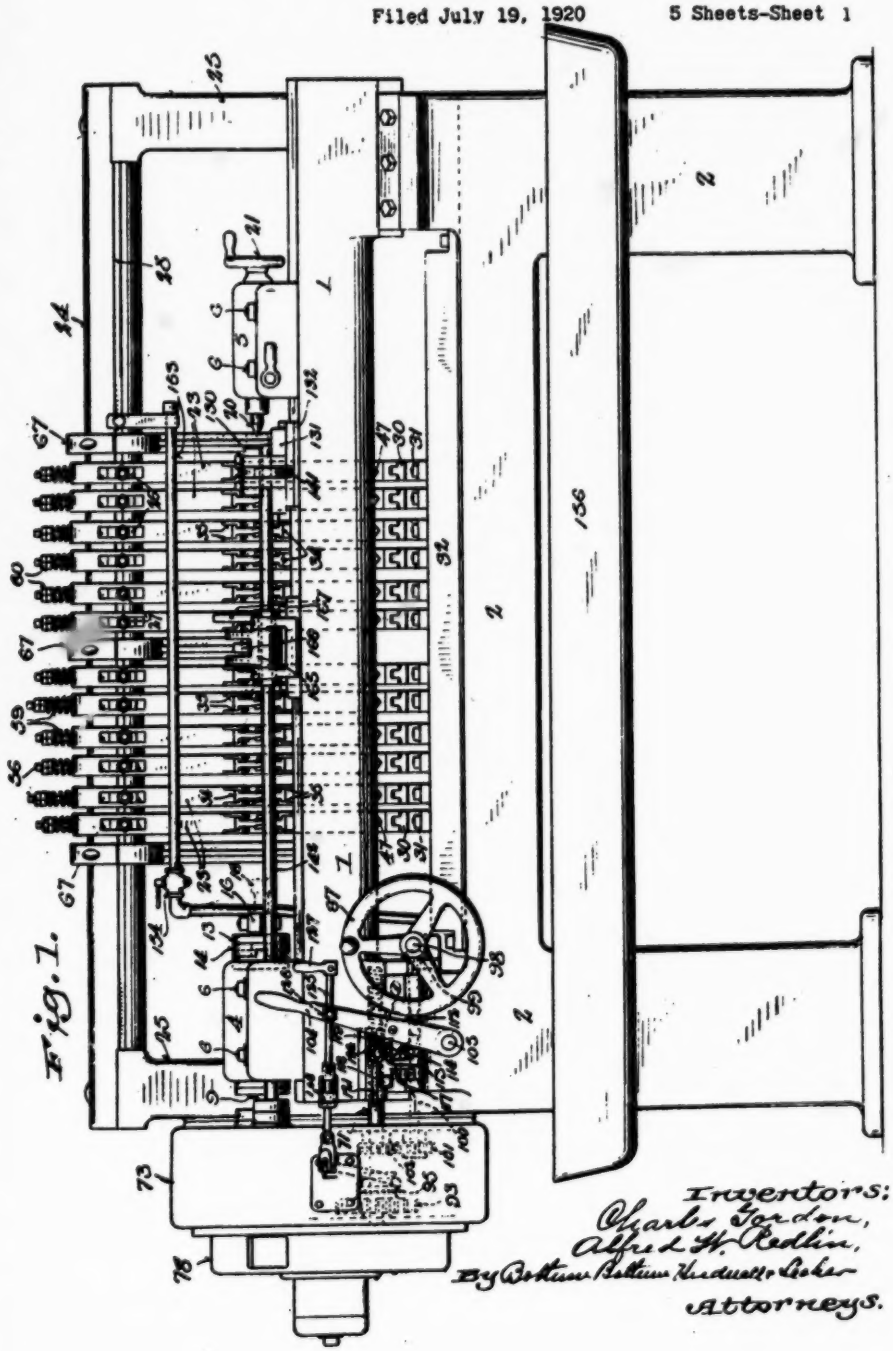

Fig. 1.

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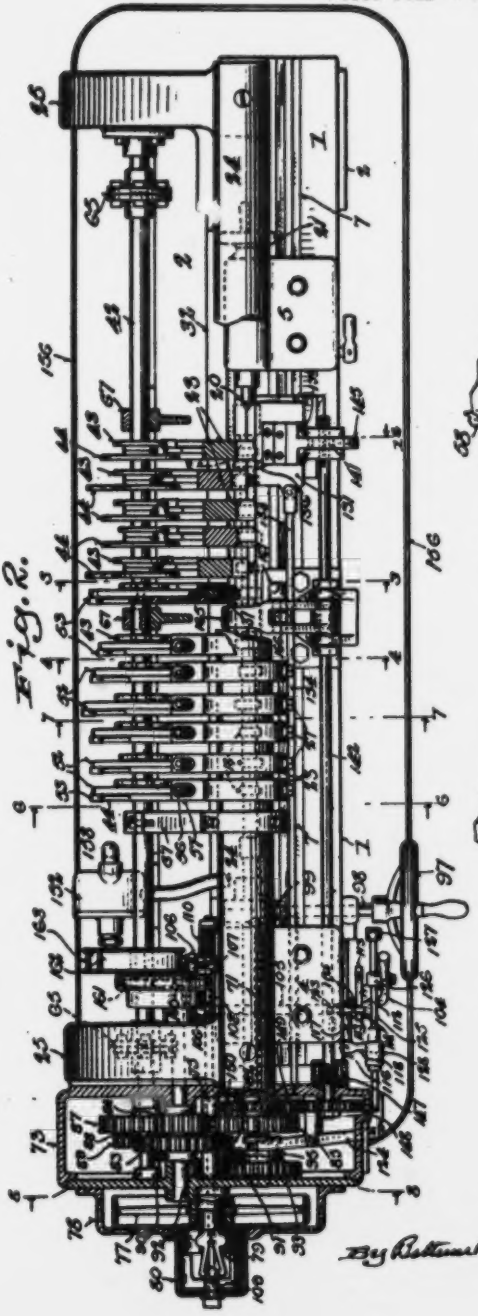

Fig. 2.

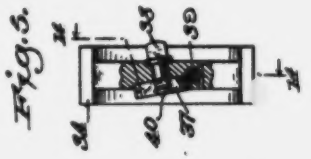

Fig. 5.

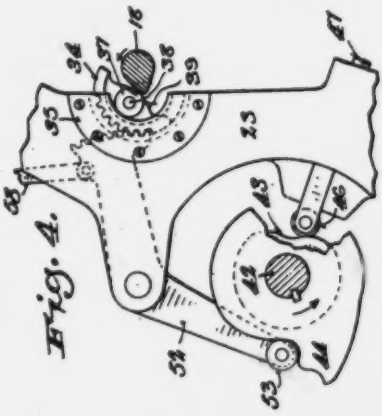

Fig. 4.

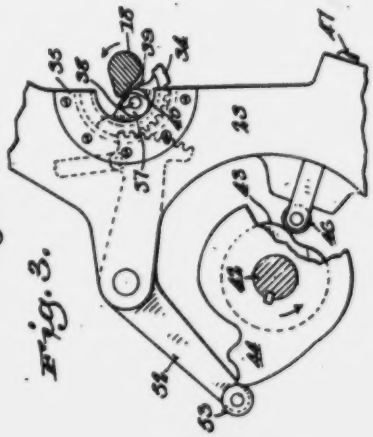

Fig. 3.

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June 16, 1925. 1,542,803

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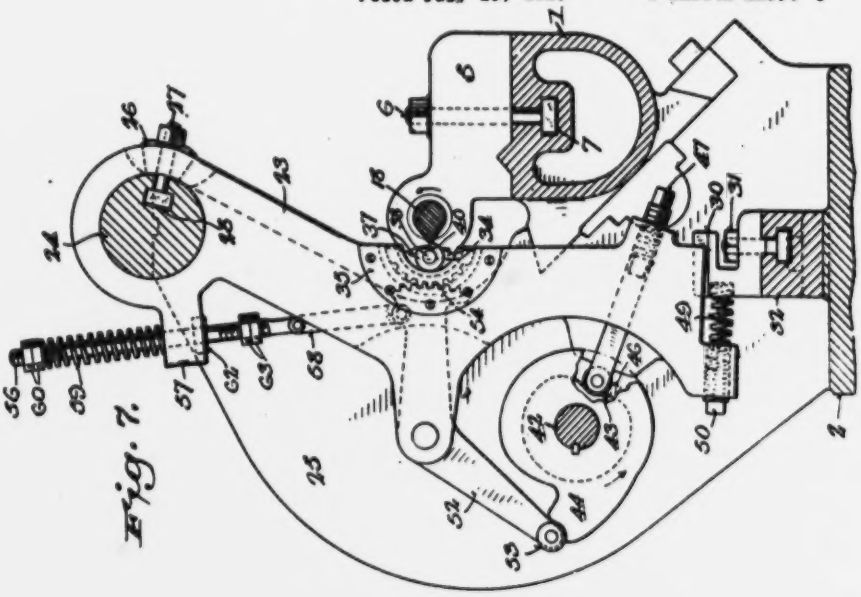

Fig. 7.

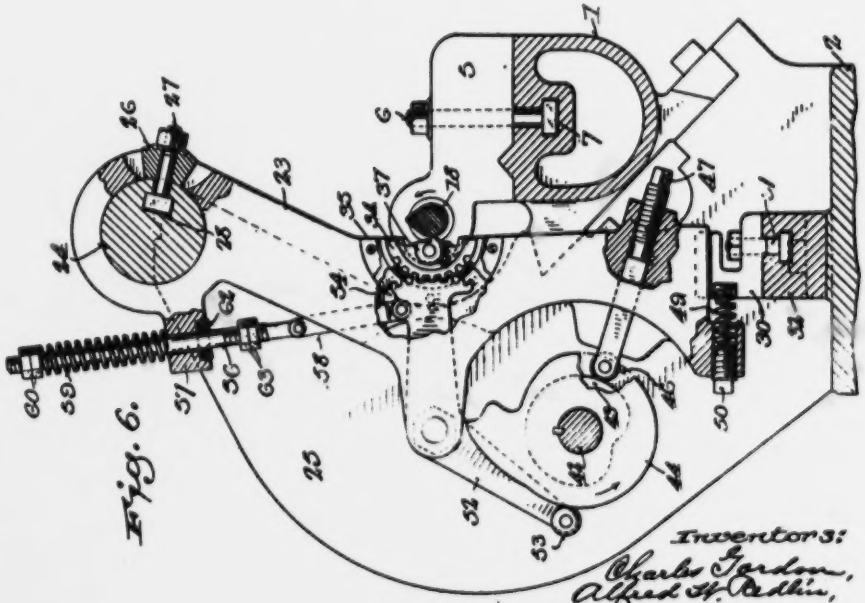

Fig. 6.

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1,542,803

C. GORDON ET AL

LATHE

Filed July 19, 1920

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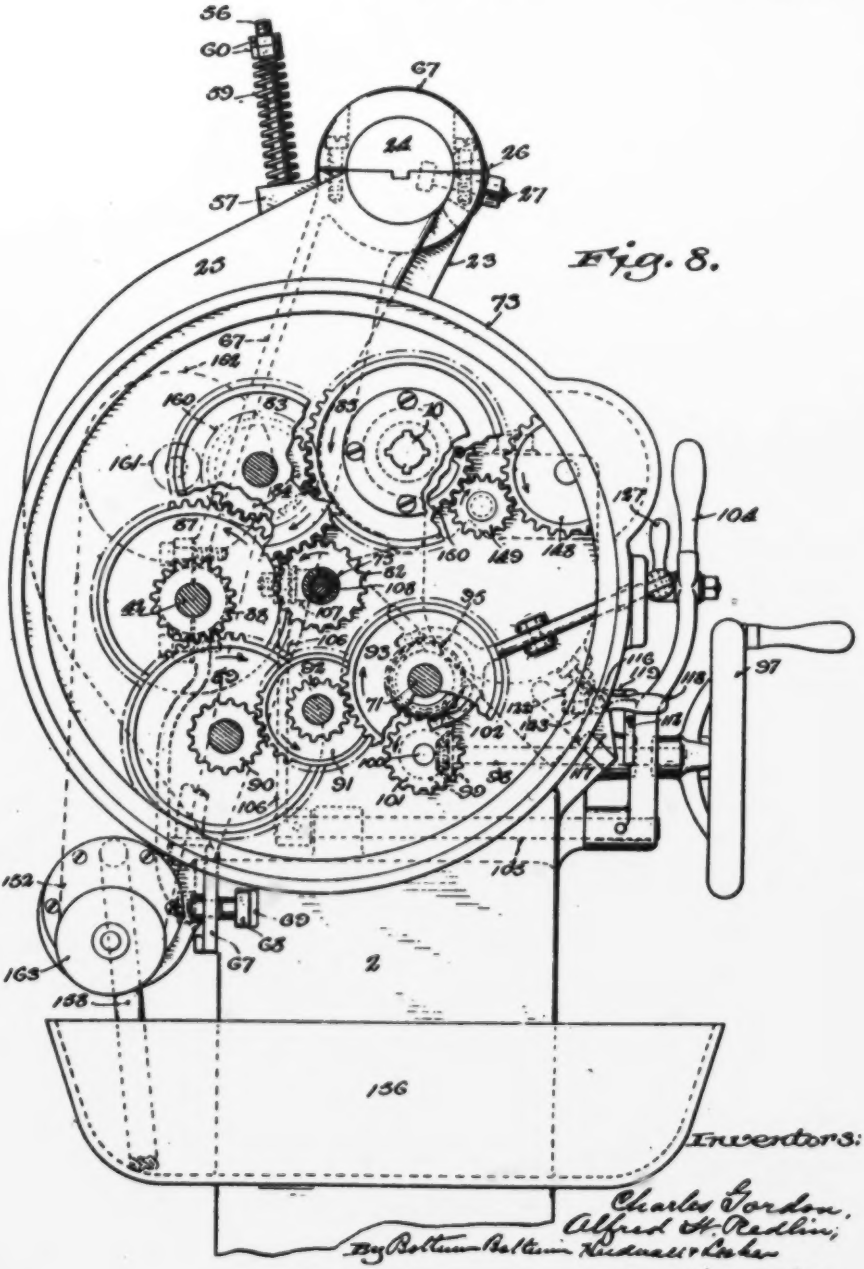

Fig. 8.

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June 16, 1925. 1,542,803

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LATHE

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Fig. 9.

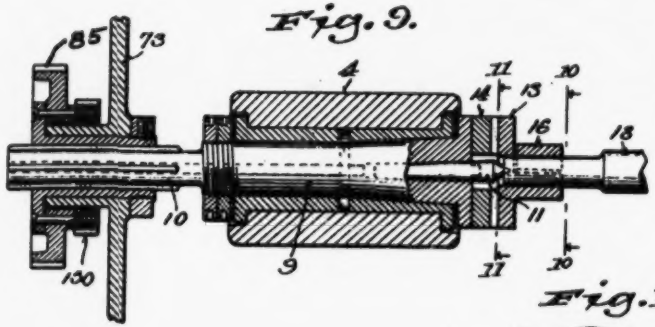


Fig. 10.

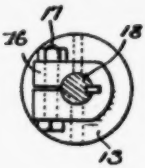


Fig. 11.

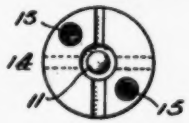


Fig. 12.

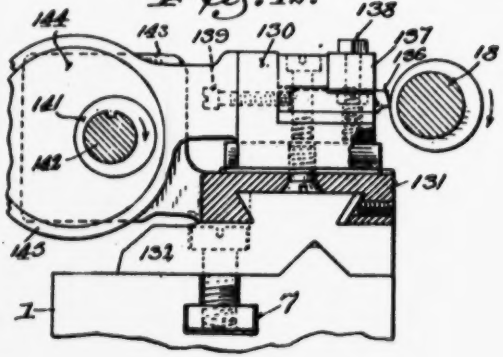
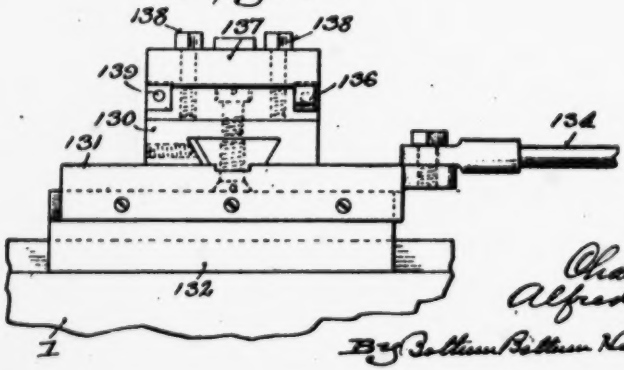


Fig. 14.

Fig. 13.



Inventors:
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Patented June 16, 1925. 1,542,803

UNITED STATES PATENT OFFICE.

CHARLES GORDON, OF MILWAUKEE, WISCONSN, AND ALFRED W. REDLIN, OF SAGINAW, MICHIGAN, ASSIGNORS, BY MESNE ASSIGNMENTS, TO THE GORDON FORM LATHE COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

LATHE.

Application filed July 19, 1920. Serial No. 397,239.

To all whom it may concern:

Be it known that we, CHARLES GORDON and ALFRED W. REDLIN, citizens of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, and at Saginaw, in the county of Saginaw and State of Michigan, respectively, have invented certain new and useful Improvements in Lathes, of which the following is a specification, reference being had to the accompanying drawing, forming a part thereof.

This invention relates more particularly to lathes for turning irregular or non-circular bodies such as cams, cheek pieces of cranks, etc.

Its main objects are to expedite and facilitate turning or shaping such bodies with accuracy; to maintain the cutting tool at the proper cutting and clearance angles to the work by varying the angle of the tool relative to its support and the work while the cutting is being done; and generally to adapt the construction and operation of a lathe to successfully perform this kind of work.

It consists in the construction, arrangement and combination of parts as hereinafter particularly described and pointed out in the claims.

In the accompanying drawing like characters designate the same parts in the several figures.

Figure 1 is a front elevation of a lathe embodying the invention and specially designed for rough-turning cams on the cam shafts of internal combustion engines; Fig. 2 is a plan view of the machine, parts of which are shown in horizontal section and other parts broken away; Fig. 3 is an enlarged vertical cross section on the line 3—3, Fig. 2, illustrating the operation of tool shifting and controlling cams and a cutting tool with relation to a cam shaft constituting the work; Fig. 4 is a similar section on the line 4—4, Fig. 2, showing a cutting tool in a different relation to the work and tool shifting and controlling cams in corresponding positions; Fig. 5 is an enlarged front elevation and section on the line 5—5, Fig. 14, of a tool holder and a cutting tool; Figs. [illegible] are enlarged vertical cross sections 2, showing a cutting tool in different relations to the work and shifting and controlling cams in corresponding positions; Fig. 8 is an enlarged end elevation of the machine as viewed from the left relative to Figs. 1 and 2, showing the transmission gearing, the gear case cover being removed; Fig. 9 is an enlarged longitudinal section of the carriage head stock, rotary work holder, spindle and driving connection; Figs. 10 and 11 are detail views in the planes indicated by dotted lines 10—10 and 11—11 respectively, Fig. 9, of the separable parts of the rotary work holder and floating coupling for connecting it with the spindle; Fig. 12 is an enlarged sectional detail view on the line 12—12, Fig. 2, of an attachment for rough-turning eccentrics on engine cam shafts; Fig. 13 is a rear elevation of the attachment; and Fig. 14 is a side elevation and partial section on the line 14—14, Fig. 5 of a tool holder and tool.

The machine comprises a work supporting carriage 1, guided horizontally and movable longitudinally in suitable ways at the ends of a frame 2.

On the carriage 1, are mounted and adjustable lengthwise thereof, a head stock 4 and a tail stock 5, which are fastened in place thereon by bolts 6, engaging a longitudinal T-groove or undercut slot 7 in the carriage, as shown in Figs. 6 and 7.

A spindle 9, journaled as shown in Fig. 9, in the head stock 4 is provided at one end with a splined extension 10, which forms an axially sliding rotating connection with a driving member of transmission gearing as hereinafter explained. At the other end the spindle 9 is provided with a cone pointed center 11, and with a work holder having a floating or self-centering connection with the spindle. As shown in Figs. 9, 10 and 11, the work holder and floating coupling for connecting it with the spindle consists of two separable members 13 and 14, which are connected with each other and with the end of the spindle by radial tongues and grooves like or similar to those of an Oldham coupling. The member 14 is loosely fastened to the spindle by screws 15 threaded in the spindle and passing through enlarged countersunk holes in said member,

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Patented June 16, 1925. 1,542,803

UNITED STATES PATENT OFFICE.

CHARLES GORDON, OF MILWAUKEE, WISCONSN, AND ALFRED W. REDLIN, OF SAGINAW, MICHIGAN, ASSIGNORS, BY MESNE ASSIGNMENTS, TO THE GORDON FORM LATHE COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

LATHE.

Application filed July 19, 1920. Serial No. 397,339.

To all whom it may concern:

Be it known that we, CHARLES GORDON and ALFRED W. REDLIN, citizens of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, and at Saginaw, in the county of Saginaw and State of Michigan, respectively, have invented certain new and useful Improvements in Lathes, of which the following is a specification, reference being had to the accompanying drawing, forming a part thereof.

This invention relates more particularly to lathes for turning irregular or non-circular bodies such as cams, cheek pieces of cranks, etc.

Its main objects are to expedite and facilitate turning or shaping such bodies with accuracy; to maintain the cutting tool at the proper cutting and clearance angles to the work by varying the angle of the tool relative to its support and the work while the cutting is being done; and generally to adapt the construction and operation of a lathe to successfully perform this kind of work.

It consists in the construction, arrangement and combination of parts as hereinafter particularly described and pointed out in the claims.

In the accompanying drawing like characters designate the same parts in the several figures.

Figure 1 is a front elevation of a lathe embodying the invention and specially designed for rough-turning cams on the cam shafts of internal combustion engines; Fig. 2 is a plan view of the machine, parts of which are shown in horizontal section and other parts broken away; Fig. 3 is an enlarged vertical cross section on the line 3—3, Fig. 2, illustrating the operation of tool shifting and controlling cams and a cutting tool with relation to a cam shaft constituting the work; Fig. 4 is a similar section on the line 4—4, Fig. 2, showing a cutting tool in a different relation to the work and tool shifting and controlling cams in corresponding positions; Fig. 5 is an enlarged front elevation and section on the line 5—5, Fig. 14, of a tool holder and a cutting tool; Figs. 6 and 7 are enlarged vertical cross sections on the lines 6—6 and 7—7 respectively, Fig. 2, showing a cutting tool in different relations to the work and shifting and controlling cams in corresponding positions; Fig. 8 is an enlarged end elevation of the machine as viewed from the left relative to Figs. 1 and 2, showing the transmission gearing, the gear case cover being removed; Fig. 9 is an enlarged longitudinal section of the carriage head stock, rotary work holder, spindle and driving connection; Figs. 10 and 11 are detail views in the planes indicated by dotted lines 10—10 and 11—11 respectively, Fig. 9, of the separable parts of the rotary work holder and floating coupling for connecting it with the spindle; Fig. 12 is an enlarged sectional detail view on the line 12—12, Fig. 2, of an attachment for rough-turning eccentrics on engine cam shafts; Fig. 13 is a rear elevation of the attachment; and Fig. 14 is a side elevation and partial section on the line 14—14, Fig. 5 of a tool holder and tool.

The machine comprises a work supporting carriage 1, guided horizontally and movable longitudinally in suitable ways at the ends of a frame 2.

On the carriage 1, are mounted and adjustable lengthwise thereof, a head stock 4 and a tail stock 5, which are fastened in place thereon by bolts 6, engaging a longitudinal T-groove or undercut slot 7 in the carriage, as shown in Figs. 6 and 7.

A spindle 9, journaled as shown in Fig. 9, in the head stock 4 is provided at one end with a splined extension 10, which forms an axially sliding rotating connection with a driving member of transmission gearing as hereinafter explained. At the other end the spindle 9 is provided with a cone pointed center 11, and with a work holder having a floating or self-centering connection with the spindle. As shown in Figs. 9, 10 and 11, the work holder and floating coupling for connecting it with the spindle consists of two separable members 13 and 14, which are connected with each other and with the end of the spindle by radial tongues and grooves like or similar to those of an Oldham coupling. The member 14 is loosely fastened to the spindle by screws 15 threaded in the spindle and passing through enlarged countersunk holes in said member, as shown in Fig. 11. The member 13 is

formed with a split collar 16, provided with a clamping bolt 17 for fastening it on and in driving relation to the end of a cam shaft 18. The radial tongues and grooves on opposite sides of the center of the adjoining faces of the members 13 and 14 are made of different widths, as shown in Fig. 11, so that they can only be assembled in driving engagement in a certain angular relation to each other.

The tail stock 5 is provided in axial alignment with the spindle 9 and its center 11, with a cone pointed center 20, axially adjustable in the usual manner, by means of a screw and a hand wheel or crank 21 for shifting it into and out of engagement with a cam shaft, the opposite end of which is held on the head center 11.

The adjustment of the tail stock 5 provides for cam shafts of different lengths, while the adjustment of the head stock provides for turning cams which are at different distances from the ends of their shafts which are clamped in the work holder next to the spindle 9, and cams which are so closely spaced that they can not all be turned at one setting on account of the wider spacing of the cutting tools, with the closest practicable adjustment of which they are capable, but require two settings, alternate cams being turned with each setting.

Rocker arms or tool carriers or supporting members 23 are pivotally suspended or mounted on a cylindrical bar 24, carried above and parallel with the axis of the spindle 9 by standards 25 on the ends of the frame 2. The rocker arms are separately adjustable lengthwise on the bar 24 and are held thereon in the proper spaced relation to one another by guide blocks 26, fitted in slots in the hubs of the arms and adjustably fastened to the bar by bolts 27 engaging a longitudinal T-groove or undercut slot 28 in the bar, as shown in Figs. 1, 6 and 7. At their lower ends the rocker arms 23 are forked or grooved transversely to the bar 24, and engage guide blocks 30, which are adjustably fastened by bolts 31 in a T-groove or undercut slot in a guide rail 32, secured on the bed of the frame 2 parallel with the bar 24, as shown in Fig. 1, 6 and 7.

As shown in Figs. 3, 4, 6 and 7, angularly adjustable or oscillatory tool holders 34 are rotatably mounted in recesses formed in the front sides of the arms 23 with their axes opposite and parallel with the extended axis of the spindle 9 and tool holder. These tool holders, which are formed with gear teeth and laterally projecting curved flanges concentric with their axes, are guided and held in place in the recesses in the arms 23 by correspondingly curved and flanged seg-

The tool holders may be provided with cutting tools of any suitable form, having cutting edges disposed radially to and their points at the center of the axis of oscillation.

As shown in Figs. 3, 4, 5, 6, 7 and 14, circular or segmental tools 37, are fitted and adjustably held in corresponding recesses in the sides of the tool holders by bolts 38, passing through the tool holders at a slight inclination to their axes and centrally threaded in the tools. The tools are formed with angular notches or recesses in their peripheries to provide cutting edges which are disposed radially both to the axes of the tools themselves and of the tool holders, with the points at the centers of the tool holders. The tools are formed with peripheral helical teeth engaged by adjusting screws 39, swiveled in holes or sockets formed in the tool holders transversely to their axes. The slight inclination of the axes of the tools to the axes of the tool holders, as shown in Fig. 5, provides for the proper clearance of the tool below its radial cutting edge 40.

A shaft 42, rotatably mounted on the machine frame behind, below and parallel with the axis of the spindle 9 and work holder, is provided with tool operating or shifting cams 43 and tool tilting or adjusting cams 44. The rocker arms 23 are provided with cam rollers 46, adjustable by screws 47 transversely to the cam shaft, for varying the depth of the cut made by the tools. Springs 49, interposed between the guide blocks 30 and adjusting screws 50 in the lower ends of the rocker arms, swing said arms towards the cam shaft and hold the rollers 46 in engagement with the cams 43, as shown in Figs. 6 and 7.

Angular levers 52, pivoted to rearward extensions of the arms 23, are provided at one end with cam rollers 53, arranged to bear against the rear sides of the cams 44, opposite the cam shaft, and are forced or provided at the other ends with segment gears 54, meshing with the teeth of the tool holders 34.

Rods 56, guided in rearwardly projecting lugs 57 on the hubs at the upper ends of the arms 23, are connected at their lower ends by links 58 with the levers 52 between their pivots and the gears 54.

Springs 59 interposed between the lugs 57 and adjusting nuts 60 on the upper ends of the rods 56, tend to turn the gears 54 upwardly and the cutting edges of the tools 37 downwardly, and to hold the cam rollers 53 against the cams 44. The lugs 57 are provided on the under side with rubber cushions 62, and the rods 56 are provided below the cushions with nuts or adjust-

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formed with a split collar 16, provided with a clamping bolt 17 for fastening it on and in driving relation to the end of a cam shaft 18. The radial tongues and grooves on opposite sides of the center of the adjoining faces of the members 13 and 14 are made of different widths, as shown in Fig. 11, so that they can only be assembled in driving engagement in a certain angular relation to each other.

The tail stock 5 is provided in axial alignment with the spindle 9 and its center 11, with a cone pointed center 20, axially adjustable in the usual manner, by means of a screw and a hand wheel or crank 21 for shifting it into and out of engagement with a cam shaft, the opposite end of which is held on the head center 11.

The adjustment of the tail stock 5 provides for cam shafts of different lengths, while the adjustment of the head stock provides for turning cams which are at different distances from the ends of their shafts which are clamped in the work holder next to the spindle 9, and cams which are so closely spaced that they can not all be turned at one setting on account of the wider spacing of the cutting tools, with the closest practicable adjustment of which they are capable, but require two settings, alternate cams being turned with each setting.

Rocker arms or tool carriers or supporting members 23 are pivotally suspended or mounted on a cylindrical bar 24, carried above and parallel with the axis of the spindle 9 by standards 25 on the ends of the frame 2. The rocker arms are separately adjustable lengthwise on the bar 24 and are held thereon in the proper spaced relation to one another by guide blocks 26, fitted in slots in the hubs of the arms and adjustably fastened to the bar by bolts 27 engaging a longitudinal T-groove or undercut slot 28 in the bar, as shown in Figs. 1, 6 and 7. At their lower ends the rocker arms 23 are forked or grooved transversely to the bar 24, and engage guide blocks 30, which are adjustably fastened by bolts 31 in a T-groove or undercut slot in a guide rail 32, secured on the bed of the frame 2 parallel with the bar 24, as shown in Fig. 1, 6 and 7.

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The tool holders may be provided with cutting tools of any suitable form, having cutting edges disposed radially to and their points at the center of the axis of oscillation.

As shown in Figs. 3, 4, 5, 6, 7 and 14, circular or segmental tools 37, are fitted and adjustably held in corresponding recesses in the sides of the tool holders by bolts 38, passing through the tool holders at a slight inclination to their axes and centrally threaded in the tools. The tools are formed with angular notches or recesses in their peripheries to provide cutting edges which are disposed radially both to the axes of the tools themselves and of the tool holders, with the points at the centers of the tool holders. The tools are formed with peripheral helical teeth engaged by adjusting screws 39, swiveled in holes or sockets formed in the tool holders transversely to their axes. The slight inclination of the axes of the tools to the axes of the tool holders, as shown in Fig. 5, provides for the proper clearance of the tool below its radial cutting edge 40.

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Rods 56, guided in rearwardly projecting lugs 57 on the hubs at the upper ends of the arms 23, are connected at their lower ends by links 58 with the levers 52 between their pivots and the gears 54.

Springs 59 interposed between the lugs 57 and adjusting nuts 60 on the upper ends of the rods 56, tend to turn the gears 54 upwardly and the cutting edges of the tools 37 downwardly, and to hold the cam rollers 53 against the cams 44. The lugs 57 are provided on the under side with rubber cushions 62, and the rods 56 are provided below the cushions with nuts or adjustable stops 63, for limiting the movement of the levers 52 without shock or jar to the tool

holders and tools when the rollers 53 pass over the high points of the cams 44.

The spacing of the cams 43 and 44 on the shaft 42 to correspond with the variable spacing of the cams to be turned, may be varied by individual adjustment of the cams on the shaft, or preferably by making the cam shaft 42 readily removable from the machine and permanently adjusting the cams thereon for any given job, so that for turning cams of different forms and spacing, other cam shafts 42, with tool operating or shifting cams 43, and tool tilting or adjusting cams 44 of the required shapes and spacing, may be substituted. For this purpose the cam shaft 42 is made in sections which are connected by flanged or other readily detachable couplings 65, as shown in Fig. 2, so that the section on which the cams are mounted may be easily removed from the machine without disturbing the adjustment of the cams.

The machine is preferably provided as shown in Figs. 1, 2 and 8, with one or more struts or braces 67, which are adjustable lengthwise of the machine and are mounted at their upper ends on the bar 24, and are connected at their lower ends with the bed of the frame 2 by bolts 68, engaging a longitudinal T-groove or undercut slot 69 in the rear side of the bed. These struts or braces are provided with bearings for supporting the cam shaft 42, and when they are used, the bearing for the cam shaft at the end of the frame opposite the driving end of the shaft, the adjacent end section of the shaft, and the coupling 65 therefor, may be dispensed with, so that the shaft or section thereof on which the cams are mounted may be more easily and quickly removed.

The carriage 1, is traversed to carry the work mounted thereon transversely along the points of the tools 37, by a feed screw 71, parallel with the spindle 9, as shown in Figs. 1 and 2.

Referring to Figs. 1, 2 and 8, the spindle 9 and work holder and the cam shaft 42 with the tool shifting and adjusting cams 43 and 44, are rotated synchronously, and the feed screw 71 for traversing the carriage 1 and moving the work past the points of the tools 37, is rotated by transmission gearing housed in a box or case 73, attached to one end of the frame 2.

The transmission gearing comprises a tubular shaft 75, extending through and projecting at its outer end from the gear case 73, parallel with the spindle 9, cam shaft 42 and feed screw 71. On the outer end of the shaft 75 a pulley or main driving member 77 is loosely mounted, and the driving pulley is enclosed in a housing 78, mounted and angularly adjustable on the [illegible] of the gear case 73, so that the belt a motor or countershaft located in different positions relative to the machine, may lead in different directions, according to the location of the motor or countershaft. The pulley 77 is operatively connected with the shaft 75 by a friction clutch 79, covered by a housing 80, which rotates with the pulley.

A gear 82, fixed on the shaft 75, is connected by a train of speed reducing gears 83, 84 and 85, with the spindle 9 and work holder, the hub of the gear 85 having a splined or axially sliding driving connection with the extension 10 of the spindle, as shown in Fig. 9.

The gear 84 is connected by a train of speed reducing gears 87, 88, 89, 90, 91, 92 and 93 with the feed screw 71, the gear 93 being loosely mounted on the feed screw and operatively connected therewith by a clutch 95.

The gears 87 and 88 are fixed on the driving section of the cam shaft 42.

The feed screw 71 is operated manually when the clutch 95 is disengaged to traverse the carriage 1 in either direction, by a hand wheel or crank 97, mounted on the front end of a transverse shaft 98, which is connected by bevel gears 99 with a shaft 100, below and parallel with the screw 71. The shaft 100 is connected by spur gears 101 and 102 in the gear case 73, with the screw 71.

The clutch 79 is shifted to connect and disconnect the spindle 9 and work holder, cam shaft 42 and feed screw 71, with the pulley 77 by means of a lever 104, fixed on the front end of a transverse shaft 105. The shaft 105 is provided at its rear end with an upwardly extending arm 106, which is connected by an adjustable pivot coupling 107 with a rod 108 passing through the tubular shaft 75 and connected at its outer end with a jaw expander 109 of the clutch 79, as shown in Fig. 2. A spring 110 interposed between the pivot coupling 107 and an abutment on the machine frame, as shown in Fig. 2, tends to shift and hold the jaw expander 109 in releasing position.

The lever 104 is provided on the rear side with a segment 112 formed at the ends with stop lugs 113 for limiting the throw of the lever, and next to one of the lugs with a notch 114.

A short rocker shaft 116, is mounted in a bracket 117 on the frame 2 parallel with the feed screw 71 and adjacent the segment 112. At one end the rocker shaft 116 is provided with a forwardly projecting handle 118, and at the other end with a forwardly projecting finger 119, adapted by engagement with the notch 114 in the segment to hold the lever 104 in clutch-engaging position.

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holders and tools when the rollers 53 pass over the high points of the cams 44.

The spacing of the cams 43 and 44 on the shaft 42 to correspond with the variable spacing of the cams to be turned, may be varied by individual adjustment of the cams on the shaft, or preferably by making the cam shaft 42 readily removable from the machine and permanently adjusting the cams thereon for any given job, so that for turning cams of different forms and spacing, other cam shafts 42, with tool operating or shifting cams 43, and tool tilting or adjusting cams 44 of the required shapes and spacing, may be substituted. For this purpose the cam shaft 42 is made in sections which are connected by flanged or other readily detachable couplings 65, as shown in Fig. 2, so that the section on which the cams are mounted may be easily removed from the machine without disturbing the adjustment of the cams.

The machine is preferably provided as shown in Figs. 1, 2 and 8, with one or more struts or braces 67, which are adjustable lengthwise of the machine and are mounted at their upper ends on the bar 24, and are connected at their lower ends with the bed of the frame 2 by bolts 68, engaging a longitudinal T-groove or undercut slot 69 in the rear side of the bed. These struts or braces are provided with bearings for supporting the cam shaft 42, and when they are used, the bearing for the cam shaft at the end of the frame opposite the driving end of the shaft, the adjacent end section of the shaft, and the coupling 65 therefor, may be dispensed with, so that the shaft or section thereof on which the cams are mounted may be more easily and quickly removed.

The carriage 1, is traversed to carry the work mounted thereon transversely along the points of the tools 37, by a feed screw 71, parallel with the spindle 9, as shown in Figs. 1 and 2.

Referring to Figs. 1, 2 and 8, the spindle 9 and work holder and the cam shaft 42 with the tool shifting and adjusting cams 43 and 44, are rotated synchronously, and the feed screw 71 for traversing the carriage 1 and moving the work past the points of the tools 37, is rotated by transmission gearing housed in a box or case 73, attached to one end of the frame 2.

The transmission gearing comprises a tubular shaft 75, extending through and projecting at its outer end from the gear case 73, parallel with the spindle 9, cam shaft 42 and feed screw 71. On the outer end of the shaft 75 a pulley or main driving member 77 is loosely mounted, and the driving pulley is enclosed in a housing 78, mounted and angularly adjustable on the cover of the gear case 73, so that the belt (not shown) for driving the pulley from a motor or countershaft located in different positions relative to the machine, may lead in different directions, according to the location of the motor or countershaft. The pulley 77 is operatively connected with the shaft 75 by a friction clutch 79, covered by a housing 80, which rotates with the pulley.

A gear 82, fixed on the shaft 75, is connected by a train of speed reducing gears 83, 84 and 85, with the spindle 9 and work holder, the hub of the gear 85 having a splined or axially sliding driving connection with the extension 10 of the spindle, as shown in Fig. 9.

The gear 84 is connected by a train of speed reducing gears 87, 88, 89, 90, 91, 92 and 93 with the feed screw 71, the gear 93 being loosely mounted on the feed screw and operatively connected therewith by a clutch 95.

The gears 87 and 88 are fixed on the driving section of the cam shaft 42.

The feed screw 71 is operated manually when the clutch 95 is disengaged to traverse the carriage 1 in either direction, by a hand wheel or crank 97, mounted on the front end of a transverse shaft 98, which is connected by bevel gears 99 with a shaft 100, below and parallel with the screw 71. The shaft 100 is connected by spur gears 101 and 102 in the gear case 73, with the screw 71.

The clutch 79 is shifted to connect and disconnect the spindle 9 and work holder, cam shaft 42 and feed screw 71, with the pulley 77 by means of a lever 104, fixed on the front end of a transverse shaft 105. The shaft 105 is provided at its rear end with an upwardly extending arm 106, which is connected by an adjustable pivot coupling 107 with a rod 108 passing through the tubular shaft 75 and connected at its outer end with a jaw expander 109 of the clutch 79, as shown in Fig. 2. A spring 110 interposed between the pivot coupling 107 and an abutment on the machine frame, as shown in Fig. 2, tends to shift and hold the jaw expander 109 in releasing position.

The lever 104 is provided on the rear side with a segment 112 formed at the ends with stop lugs 113 for limiting the throw of the lever, and next to one of the lugs with a notch 114.

A short rocker shaft 116, is mounted in a bracket 117 on the frame 2 parallel with the feed screw 71 and adjacent the segment 112. At one end the rocker shaft 116 is provided with a forwardly projecting handle 118, and at the other end with a forwardly projecting finger 119, adapted by engagement with the notch 114 in the segment to hold the lever 104 in clutch-engaging position.

In a T-groove or undercut slot 121 formed

in the carriage 1 adjacent and parallel with the rocker shaft 116, a trip dog 122 is adjustably bolted and is adapted by engagement with a rearwardly extending arm 123, on the rocker shaft, as shown by dotted lines in Fig. 8, to turn the finger 119 upwardly out of engagement with the notch 114, and thereby release the lever 104 and permit the spring 110 to disengage the clutch 79, when the carriage 1 reaches a certain point in its advance movement, according to the adjustment of the dog.

The clutch 95 is operated by a shifting lever 124 with the outer end of which a rod 125 is pivotally connected, as shown in Fig. 2. The rod 125 passes loosely through a block 126 pivoted on the rear side of the lever 104, and is provided at the end adjacent said lever with a handle 127. The block 126 is adapted by engagement with a spring cushion 128, shown in Figs. 1 and 2 on the rod 125, to disengage the clutch 95 when the lever 104 is released and thrown by the spring 110 into position to disengage the clutch 79.

Referring to Figs. 1, 2, 12 and 13, for turning eccentrics on cam shafts simultaneously with the cams, the machine is provided with a tool supporting slide or holder 130, mounted and movable transversely to the travel of the carriage 1 on a saddle 131, which in turn is slidably mounted and guided lengthwise of the carriage on a base or supporting block 132. The base 132 is guided on and adjustable lengthwise of the carriage 1, to which it is secured in adjusted position by bolts engaging the T-grooves 7 in the carriage. A tie rod 134, arranged parallel with the carriage ways, connects the saddle 131 with the gear case 73 or a fixed part of the machine, and holds the saddle in a stationary position relative to the carriage. For adjusting the position of the eccentric turning attachment on the carriage according to the varying location of eccentrics on cam shafts to be turned, tie rods 134 of different lengths are provided.

The attachment is provided with a cutting tool 136, which is adjustably clamped in the slide or holder 130 by a bar 137 and bolts 138, and is adjusted lengthwise therein transversely to the travel of the carriage by a screw 139. The tool holder as shown, is designed for clamping a tool in either end thereof, and is provided with two adjusting screws 139.

The tool slide or holder with the tool, is moved transversely to the work or travel of the carriage by an actuating eccentric 141, loosely splined on a shaft 142, parallel with the axis of the spindle 9 and work holder, and confined with a compensating the tool holder and causes the tool 136 to turn an eccentric on a cam shaft 18 corresponding exactly with the eccentric 141.

The shaft 142 is connected as shown in Fig. 2, by an angularly adjustable coupling 147, with a driving gear 148, in the gear case 73, for varying the angular adjustment of the actuating eccentric 141 relative to the spindle 9 and work holder and the cam shaft 42.

As shown in Figs. 2 and 8, the gear 148 is connected by an idle gear 149, with a gear 150, fixed to the hub of the spindle driving gear 85, so as to rotate the shaft 142 with the eccentric 141 synchronously with the spindle 9 and work holder and the cam shaft 42.

As shown in Figs. 1, 2 and 8, the machine is provided on the rear side with a pump 152 for supplying oil or cutter liquid to the cam and eccentric turning tools through a perforated pipe 153, arranged lengthwise of the machine above the tools and provided with a controlling and regulating valve 154.

The frame 2 is formed or provided below the carriage and cutting tools with a trough or receptacle 156 for catching and holding the oil or cutter fluid supplied to the tools. The oil or cutter fluid is drawn from this trough or receptacle by the pump through a pipe 158.

The pump is driven from an extension of the shaft of the gears 83 and 84 by gears 160 and 161 indicated by dotted lines in Figs. 2 and 8, and by a pulley 162 on the shaft of the gear 161 belted to a pulley 163 on the pump shaft.

The operation of the eccentric shaft 134 and of the pump are manually and automatically controlled, like the operation of the spindle 9 and cam shaft 42, by the lever 104 and trip dog 122.

For turning cam shafts having center bearings, the machine is provided with a steady rest 165, adjustably mounted on and movable with the carriage 1, as shown in Figs. 1 and 2. This rest comprises two jaws or members, which are hinged together so that the upper jaw or member can be turned up and back out of the way, for placing the work on the carriage and removing it therefrom. The upper movable member is locked and held in operative position on the work by a dog 166, pivotally mounted in the lower member and operated by a handle 167 for engaging and disengaging it with a cross pin in the upper member. The eccentric shaft 142 passes through and is guided in a tubular bolt or pin which pivotally connects the members of the rest.

In the operation of the machine f

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in the carriage 1 adjacent and parallel with the rocker shaft 116, a trip dog 122 is adjustably bolted and is adapted by engagement with a rearwardly extending arm 123, on the rocker shaft, as shown by dotted lines in Fig. 8, to turn the finger 119 upwardly out of engagement with the notch 114, and thereby release the lever 104 and permit the spring 110 to disengage the clutch 79, when the carriage 1 reaches a certain point in its advance movement, according to the adjustment of the dog.

The clutch 95 is operated by a shifting lever 124 with the outer end of which a rod 125 is pivotally connected, as shown in Fig. 2. The rod 125 passes loosely through a block 126 pivoted on the rear side of the lever 104, and is provided at the end adjacent said lever with a handle 127. The block 126 is adapted by engagement with a spring cushion 128, shown in Figs. 1 and 2 on the rod 125, to disengage the clutch 95 when the lever 104 is released and thrown by the spring 110 into position to disengage the clutch 79.

Referring to Figs. 1, 2, 12 and 13, for turning eccentrics on cam shafts simultaneously with the cams, the machine is provided with a tool supporting slide or holder 130, mounted and movable transversely to the travel of the carriage 1 on a saddle 131, which in turn is slidably mounted and guided lengthwise of the carriage on a base or supporting block 132. The base 132 is guided on and adjustable lengthwise of the carriage 1, to which it is secured in adjusted position by bolts engaging the T-grooves 7 in the carriage. A tie rod 134, arranged parallel with the carriage ways, connects the saddle 131 with the gear case 73 or a fixed part of the machine, and holds the saddle in a stationary position relative to the carriage. For adjusting the position of the eccentric turning attachment on the carriage according to the varying location of eccentrics on cam shafts to be turned, tie rods 134 of different lengths are provided.

The attachment is provided with a cutting tool 136, which is adjustably clamped in the slide or holder 130 by a bar 137 and bolts 138, and is adjusted lengthwise therein transversely to the travel of the carriage by a screw 139. The tool holder as shown, is designed for clamping a tool in either end thereof, and is provided with two adjusting screws 139.

The tool slide or holder with the tool, is moved transversely to the work or travel of the carriage by an actuating eccentric 141, loosely splined on a shaft 142, parallel with the axis of the spindle 9 and work holder, and confined with a compensating eccentric 144 between cheek pieces 143 on the saddle. The eccentric 144 mounted on the eccentric 141, works in a strap 145 on the tool holder and causes the tool 136 to turn an eccentric on a cam shaft 18 corresponding exactly with the eccentric 141.

The shaft 142 is connected as shown in Fig. 2, by an angularly adjustable coupling 147, with a driving gear 148, in the gear case 73, for varying the angular adjustment of the actuating eccentric 141 relative to the spindle 9 and work holder and the cam shaft 42.

As shown in Figs. 2 and 8, the gear 148 is connected by an idle gear 149, with a gear 150, fixed to the hub of the spindle driving gear 85, so as to rotate the shaft 142 with the eccentric 141 synchronously with the spindle 9 and work holder and the cam shaft 42.

As shown in Figs. 1, 2 and 8, the machine is provided on the rear side with a pump 152 for supplying oil or cutter liquid to the cam and eccentric turning tools through a perforated pipe 153, arranged lengthwise of the machine above the tools and provided with a controlling and regulating valve 154.

The frame 2 is formed or provided below the carriage and cutting tools with a trough or receptacle 156 for catching and holding the oil or cutter fluid supplied to the tools. The oil or cutter fluid is drawn from this trough or receptacle by the pump through a pipe 158.

The pump is driven from an extension of the shaft of the gears 83 and 84 by gears 160 and 161 indicated by dotted lines in Figs. 2 and 8, and by a pulley 162 on the shaft of the gear 161 belted to a pulley 163 on the pump shaft.

The operation of the eccentric shaft 134 and of the pump are manually and automatically controlled, like the operation of the spindle 9 and cam shaft 42, by the lever 104 and trip dog 122.

For turning cam shafts having center bearings, the machine is provided with a steady rest 165, adjustably mounted on and movable with the carriage 1, as shown in Figs. 1 and 2. This rest comprises two jaws or members, which are hinged together so that the upper jaw or member can be turned up and back out of the way, for placing the work on the carriage and removing it therefrom. The upper movable member is locked and held in operative position on the work by a dog 166, pivotally mounted in the lower member and operated by a handle 167 for engaging and disengaging it with a cross pin in the upper member. The eccentric shaft 142 passes through and is guided in a tubular bolt or pin which pivotally connects the members of the rest.

In the operation of the machine for rough turning cam shafts having pump eccentrics, the rocker arms 23 having been adjusted on the bar 24 and the guide blocks

on the rail 32 to correspond with the spacing of the cams on the shafts to be turned, and tool shifting and adjusting cams 43 and 44 of the required shapes having been properly adjusted on the cam shaft 42, or a shaft on which such cams have been previously assembled as required for the work to be done, having been placed in the machine and connected with the transmission gearing in proper angular relation thereto, the collar 16 of the work holder is clamped on one of the end journals or bearings of a cam shaft to be turned, and the cam shaft is then placed in the machine on the centers 11 and 20, for which center seats have been accurately formed in the ends of the cam shaft.

The eccentric turning attachment being adjusted in proper position with relation to the work on the carriage 1, and connected by a tie rod 134 of the reqired length with the gear case 73, and the coupling 147 being adjusted to turn the pump eccentric in the proper angular relation to the cams to be simultaneously turned on the same shaft, the operator throws the lever 104 to the right, as shown in Figs. 1 and 2, thereby engaging the clutch 79, and operatively connecting the spindle 9 and the tool controlling cam shaft 42 with the driving pulley 77. The finger 119 dropping into the notch 114 of the segment 112, locks and holds the clutch 79 in engagement against the tension of the spring 110.

The trip dog 122 having been adjusted in the groove 121 to stop the machine when the cutting tools have all cleared the cams and eccentric on the work shaft mounted on the carriage 1, and the carriage having been run back to its starting position at the left by the hand wheel or crank 97, the handle 127 is shifted to the right by the operator, thereby engaging the clutch 95 and operatively connecting the feed screw 71 with the gear 93.

As the work is fed with the carriage past the points of the cutting tools 37 and 136 and is rotated with the spindle 9 and work holder, the cams and eccentric on the work shaft are simultaneously turned to the required shapes and in the proper angular relation to one another, determined by the shapes and adjustment of the tool shifting cams 43, and the adjustment of the eccentric turning tool 136 and its actuating eccentric 141.

The cam turning tools 37 are automatically tilted or angularly adjusted and maintained at the proper cutting and clearance angles to the several parts of the work, as illustrated in Figs. 3, 4, 6 and 7, by the cams 44.

When the several parts of the work have been turned, the tools which have operated with the arm 123, lifts the finger 119 out of the notch 114 in the segment 112, thereby releasing the lever 104, which is then thrown by the spring 110 to the left, the clutch 79 being simultaneously disengaged and the pulley 77 or main driving member of the machine being disconnected from the transmission gearing through which the several operative parts of the machine are actuated.

When the lever 104 is thus thrown to the left by the spring 110, the block 126 by engagement with the cushion 128 shifts the lever 124 and disengages the clutch 95, thereby disconnecting the feed screw 71 from the transmission gear 93, so that the table 1 can be manually returned to its starting position by the hand wheel or crank 97.

Any eccentricity or inaccuracy in the journal or bearing of the cam shaft 18 which is clamped in the work holder 13, is compensated for by the floating connection of the work holder with the spindle 9, the true position of the work in the machine being determined by the head and tail centers 11 and 20.

When the cams or parts of the work are so closely spaced that they cannot all be turned at once on account of the limit to the close spacing of the rocker arms 23 and the tool operating and controlling cams 43 and 44, due to structural considerations, the rocker arms are adjusted on the bar 24 and the cams on the shaft 42, to turn alternate cams or parts of the work, which then requires two settings or adjustments of the head and tail stocks 4 and 5 and of the trip dog 122.

One or more of the rocker arms and corresponding tool operating and controlling cams may be used, according to the work to be performed.

For turning single non-circular or irregular pieces such as the cheek pieces of crank shafts, the spindle 9 is to be provided with a work holder and driving connection of the proper construction, according to the shape of the work, and the tail stock 5, eccentric turning attachment, with its base block 132, steady rest 165, and more or less of the rocker arms 23 may be removed from the machine or left thereon, if they are not in the way.

Various changes in the construction and arrangement of parts of the machine to adapt it for turning work of different kinds having more or less parts of various shapes and arrangements, may be made without departure from the principle and scope of the invention, as defined in the following claims.

We claim:

1. In a lathe the combination of a work holder, a tool carrier movable transversely to the axial line of the work holder, a tool

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on the rail 32 to correspond with the spacing of the cams on the shafts to be turned, and tool shifting and adjusting cams 43 and 44 of the required shapes having been properly adjusted on the cam shaft 42, or a shaft on which such cams have been previously assembled as required for the work to be done, having been placed in the machine and connected with the transmission gearing in proper angular relation thereto, the collar 16 of the work holder is clamped on one of the end journals or bearings of a cam shaft to be turned, and the cam shaft is then placed in the machine on the centers 11 and 20, for which center seats have been accurately formed in the ends of the cam shaft.

The eccentric turning attachment being adjusted in proper position with relation to the work on the carriage 1, and connected by a tie rod 134 of the reqired length with the gear case 73, and the coupling 147 being adjusted to turn the pump eccentric in the proper angular relation to the cams to be simultaneously turned on the same shaft, the operator throws the lever 104 to the right, as shown in Figs. 1 and 2, thereby engaging the clutch 79, and operatively connecting the spindle 9 and the tool controlling cam shaft 42 with the driving pulley 77. The finger 119 dropping into the notch 114 of the segment 112, locks and holds the clutch 79 in engagement against the tension of the spring 110.

The trip dog 122 having been adjusted in the groove 121 to stop the machine when the cutting tools have all cleared the cams and eccentric on the work shaft mounted on the carriage 1, and the carriage having been run back to its starting position at the left by the hand wheel or crank 97, the handle 127 is shifted to the right by the operator, thereby engaging the clutch 95 and operatively connecting the feed screw 71 with the gear 93.

As the work is fed with the carriage past the points of the cutting tools 37 and 136 and is rotated with the spindle 9 and work holder, the cams and eccentric on the work shaft are simultaneously turned to the required shapes and in the proper angular relation to one another, determined by the shapes and adjustment of the tool shifting cams 43, and the adjustment of the eccentric turning tool 136 and its actuating eccentric 141.

The cam turning tools 37 are automatically tilted or angularly adjusted and maintained at the proper cutting and clearance angles to the several parts of the work, as illustrated in Figs. 3, 4, 6 and 7, by the cams 44.

When the several parts of the work have all cleared the tools which have operated thereon, the trip dog 122 by engagement with the arm 123, lifts the finger 119 out of the notch 114 in the segment 112, thereby releasing the lever 104, which is then thrown by the spring 110 to the left, the clutch 79 being simultaneously disengaged and the the pulley 77 or main driving member of the machine being disconnected from the transmission gearing through which the several operative parts of the machine are actuated.

When the lever 104 is thus thrown to the left by the spring 110, the block 126 by engagement with the cushion 128 shifts the lever 124 and disengages the clutch 95, thereby disconnecting the feed screw 71 from the transmission gear 93, so that the table 1 can be manually returned to its starting position by the hand wheel or crank 97.

Any eccentricity or inaccuracy in the journal or bearing of the cam shaft 18 which is clamped in the work holder 13, is compensated for by the floating connection of the work holder with the spindle 9, the true position of the work in the machine being determined by the head and tail centers 11 and 20.

When the cams or parts of the work are so closely spaced that they cannot all be turned at once on account of the limit to the close spacing of the rocker arms 23 and the tool operating and controlling cams 43 and 44, due to structural considerations, the rocker arms are adjusted on the bar 24 and the cams on the shaft 42, to turn alternate cams or parts of the work, which then requires two settings or adjustments of the head and tail stocks 4 and 5 and of the trip dog 122.

One or more of the rocker arms and corresponding tool operating and controlling cams may be used, according to the work to be performed.

For turning single non-circular or irregular pieces such as the cheek pieces of crank shafts, the spindle 9 is to be provided with a work holder and driving connection of the proper construction, according to the shape of the work, and the tail stock 5, eccentric turning attachment, with its base block 132, steady rest 165, and more or less of the rocker arms 23 may be removed from the machine or left thereon, if they are not in the way.

Various changes in the construction and arrangement of parts of the machine to adapt it for turning work of different kinds having more or less parts of various shapes and arrangements, may be made without departure from the principle and scope of the invention, as defined in the following claims.

We claim:

1. In a lathe the combination of a work holder, a tool carrier movable transversely to the axial line of the work holder, a tool mounted and angularly movable on the car-

rier, automatic means for moving the carrier towards and from the work, and means for varying the angular relation of the tool to the carrier and work to maintain proper cutting and clearance angles of the tool to work of non-circular contour synchronously with the rotation of the work.

2. In a lathe the combination of a rotary work holder, a tool holder provided with a cutting tool, movable towards and from the axial line of the work holder and angularly adjustable in a plane transverse to the axis of the work holder, cams adapted to vary the distance between the point of the tool and the axial line of the work holder and to vary the adjustment of the tool for maintaining proper cutting and clearance angles of the tool to work of non-circular contour, means for synchronously rotating the work holder and cams, and means for simultaneously causing relative movement between the work holder and tool holder axially with relation to the work holder.

3. In a lathe the combination of a rotary tool holder, means for rotating the same, an angularly adjustable tool holder movable transversely to the axis of the work holder, a tool carried by the tool holder with its cutting edge radial to and its point at the center of its angular adjusting movement, and cams rotated synchronously with the work holder, one adapted to shift the tool holder and tool transversely to the axis of the work holder and the other to vary the angular adjustment of the tool holder and tool relative to the work.

4. In a lathe the combination of a rotary work holder, means for rotating said holder, a tool supporting member movable transversely to the axis of the work holder, a tool holder carried by said supporting member opposite the axis of the work holder and oscillatory about an axis parallel with the axis of the work holder, a tool mounted in the tool holder with its point at the center of oscillation of the tool holder, and tool shifting and adjusting cams rotated synchronously with the work holder, one adapted to shift the tool supporting member transversely to the axis of the work holder and the other to oscillate the tool holder with the tool while the tool is working.

5. In a lathe the combination of a rotary work holder, means for rotating said holder, a tool supporting member movable transversely to the axis of the work holder, a segmental, toothed tool holder carried by said supporting member opposite the axis of the work holder and oscillatory about an axis parallel with the axis of the work with the tool holder, and tool shifting and adjusting cams rotated synchronously with the work holder, one adapted to shift said supporting member with the tool holder and tool transversely to the axis of the work holder and the other to oscillate the toothed arm and tool holder with the tool relative to the supporting member.

6. In a lathe the combination of a rotary work holder, means for rotating said holder, a rocker arm mounted to swing transversely to the axis of the work holder on an axis parallel therewith, a tool holder carried by said rocker arm and oscillatory on an axis opposite and parallel with the axis of the work holder, a tool mounted in the tool holder with its point at the center of oscillation, a tool shifting cam adapted to swing said rocker arm with the tool holder and tool transversely to the axis of the work holder, a tool adjusting cam adapted to oscillate the tool holder and tool relative to the rocker arm, and means for rotating the cams synchronously with the work holder.

7. In a lathe the combination of a rotary work holder, means for rotating said holder, a tool supporting member movable transversely to the axis of the work holder, a tool holder carried by said supporting member and oscillatory about an axis opposite and parallel with the axis of the work holder, a tool mounted in the tool holder with its point at the center of oscillation, a cam adapted to shift the tool supporting member towards the work holder, means for adjusting the movement of said supporting member by the cam to vary the depth of cut by the tool, a cam adapted to oscillate the tool holder and tool to maintain the proper angle of the tool relative to the work, and means for rotating the cams synchronously with the work holder.

8. In a lathe the combination of a rotary work holder, a rocker arm pivotally mounted on an axis parallel with the axis of the work holder and provided with an adjustable cam roller, a segmental toothed tool holder carried by the rocker arm and oscillatory on an axis parallel with and opposite the axis of the work holder, a tool carried by the tool holder with its point at the center of oscillation, a tool tilting lever pivoted on the rocker arm and provided with a cam roller and with a toothed segment meshing with the tool holder, a shaft parallel with the axis of the work holder and provided with cams engaging the cam rollers, springs acting on the rocker arm and tool tilting lever and holding the cam rollers in engagement with the cams, and means for rotating the work holder

rier, automatic means for moving the carrier towards and from the work, and means for varying the angular relation of the tool to the carrier and work to maintain proper cutting and clearance angles of the tool to work of non-circular contour synchronously with the rotation of the work.

2. In a lathe the combination of a rotary work holder, a tool holder provided with a cutting tool, movable towards and from the axial line of the work holder and angularly adjustable in a plane transverse to the axis of the work holder, cams adapted to vary the distance between the point of the tool and the axial line of the work holder and to vary the adjustment of the tool for maintaining proper cutting and clearance angles of the tool to work of non-circular contour, means for synchronously rotating the work holder and cams, and means for simultaneously causing relative movement between the work holder and tool holder axially with relation to the work holder.

3. In a lathe the combination of a rotary tool holder, means for rotating the same, an angularly adjustable tool holder movable transversely to the axis of the work holder, a tool carried by the tool holder with its cutting edge radial to and its point at the center of its angular adjusting movement, and cams rotated synchronously with the work holder, one adapted to shift the tool holder and tool transversely to the axis of the work holder and the other to vary the angular adjustment of the tool holder and tool relative to the work.

4. In a lathe the combination of a rotary work holder, means for rotating said holder, a tool supporting member movable transversely to the axis of the work holder, a tool holder carried by said supporting member opposite the axis of the work holder and oscillatory about an axis parallel with the axis of the work holder, a tool mounted in the tool holder with its point at the center of oscillation of the tool holder, and tool shifting and adjusting cams rotated synchronously with the work holder, one adapted to shift the tool supporting member transversely to the axis of the work holder and the other to oscillate the tool holder with the tool while the tool is working.

5. In a lathe the combination of a rotary work holder, means for rotating said holder, a tool supporting member movable transversely to the axis of the work holder, a segmental, toothed tool holder carried by said supporting member opposite the axis of the work holder and oscillatory about an axis parallel with the axis of the work holder, a tool mounted in the tool holder with its point at the center of oscillation, a segmentally toothed arm pivotally mounted on the tool supporting member in mesh with the tool holder, and tool shifting and adjusting cams rotated synchronously with the work holder, one adapted to shift said supporting member with the tool holder and tool transversely to the axis of the work holder and the other to oscillate the toothed arm and tool holder with the tool relative to the supporting member.

6. In a lathe the combination of a rotary work holder, means for rotating said holder, a rocker arm mounted to swing transversely to the axis of the work holder on an axis parallel therewith, a tool holder carried by said rocker arm and oscillatory on an axis opposite and parallel with the axis of the work holder, a tool mounted in the tool holder with its point at the center of oscillation, a tool shifting cam adapted to swing said rocker arm with the tool holder and tool transversely to the axis of the work holder, a tool adjusting cam adapted to oscillate the tool holder and tool relative to the rocker arm, and means for rotating the cams synchronously with the work holder.

7. In a lathe the combination of a rotary work holder, means for rotating said holder, a tool supporting member movable transversely to the axis of the work holder, a tool holder carried by said supporting member and oscillatory about an axis opposite and parallel with the axis of the work holder, a tool mounted in the tool holder with its point at the center of oscillation, a cam adapted to shift the tool supporting member towards the work holder, means for adjusting the movement of said supporting member by the cam to vary the depth of cut by the tool, a cam adapted to oscillate the tool holder and tool to maintain the proper angle of the tool relative to the work, and means for rotating the cams synchronously with the work holder.

8. In a lathe the combination of a rotary work holder, a rocker arm pivotally mounted on an axis parallel with the axis of the work holder and provided with an adjustable cam roller, a segmental toothed tool holder carried by the rocker arm and oscillatory on an axis parallel with and opposite the axis of the work holder, a tool carried by the tool holder with its point at the center of oscillation, a tool tilting lever pivoted on the rocker arm and provided with a cam roller and with a toothed segment meshing with the tool holder, a shaft parallel with the axis of the work holder and provided with cams engaging the cam rollers, springs acting on the rocker arm and tool tilting lever and holding the cam rollers in engagement with the cams, and means for rotating the work holder and cams synchronously.

9. In a lathe the combination of a rotary work holder, a rocker arm mounted at one end on a fixed axis parallel with the axis

of the work holder, a stationary guide engaging said arm at its other end, an oscillatory tool holder mounted on the rocker arm with its axis opposite and parallel with the axis of the work holder and provided with a cutting tool having its point at the center of oscillation, a cam adapted to move the rocker arm transversely to the work, a cam adapted to oscillate the tool holder and maintain the tool at the proper angle to the work, and means for rotating the work holder and cams synchronously.

10. In a lathe the combination of an oscillatory tool holder, an angularly adjustable segmental toothed cutting tool pivotally mounted in the tool holder with its periphery intersecting the axis of oscillation of the tool holder, and an adjusting screw swiveled in the tool holder transversely to the tool pivot and engaging the teeth of the tool.

11. In a lathe the combination of an oscillatory tool holder, and a segmental tool angularly adjustable in said holder on an axis inclined to the axis of the holder, and having a radial cutting edge terminating with its periphery at the center of oscillation of the holder.

12. In a lathe the combination of a frame, a work carriage guided thereon, means for feeding the carriage, a head stock mounted on the carriage, a rotary spindle journaled in the head stock and provided at one end with a centering work holder and at the other with a driving connection, a tail stock adjustable on the carriage towards and from the head stock and provided with an axially adjustable center in axial alignment with the spindle, tool supporting members movable transversely to the carriage, oscillatory tool holders mounted on said supporting members and provided with cutting tools, work shaping and tool adjusting cams, and means for rotating the work holder and cams synchronously.

13. In a lathe the combination of a frame, a carriage mounted thereon and provided with a rotary work holder, means for feeding the carriage, a bar mounted on the frame, rocker arms pivotally mounted on said bar, cutting tools carried by said arms and movable therewith transversely to the path of the carriage, cams adapted to shift the arms with the tools relative to the work for producing the desired shapes of parts on which the tools operate, and means for rotating the work holder and cams synchronously.

14. In a lathe the combination of a frame, a carriage mounted thereon and provided with a rotary work holder, means for feeding the carriage, a stationary bar mounted

ried by said arms and provided with cutting tools having their points at the center of oscillation of the tool holders, levers pivoted on the rocker arms and geared with the tool holders, a shaft provided with tool shifting and tilting cams adapted to actuate said rocker arms and levers, and means for rotating the work holder and cam shaft synchronously.

15. In a lathe the combination of a frame, a carriage guided thereon and provided with a rotary work holder, means for feeding the carriage, rocker arms pivotally mounted on an axis parallel with the carriage travel and separately adjustable lengthwise of said axis, angularly adjustable cutting tools carried by the rocker arms, a shaft parallel with the pivot axis of the rocker arms and provided with tool shifting and tilting cams adjustable lengthwise thereof, and means for rotating the tool holder and cam shaft synchronously.

16. In a lathe the combination of a frame, a carriage guided thereon and provided with a rotary work holder, means for feeding the carriage, rocker arms pivotally mounted on the frame and provided with cutting tools movable therewith transversely to the travel of the carriage, cams for swinging the rocker arms, a shaft on which the cams are assembled removably mounted on the frame, and transmission gearing adapted to rotate the work holder and cam shaft synchronously and having a driving member with which the cam shaft is coaxially and detachably connected.

17. In a lathe the combination of a frame, a carriage guided on the frame and provided with a rotary work holder, means for feeding the carriage, tool supports movable transversely to the carriage travel, angularly movable tools carried by said supports, cams for shifting said supports with the tools relative to the work, cams for varying the angular relation of the tools to said supports, a saddle slidably mounted and guided on the carriage lengthwise thereof, a tool holder guided and movable on the saddle transversely to the carriage travel, an eccentric mounted on said saddle and connected with the tool holder, means for holding said saddle in a fixed position relative to the carriage, and transmission gearing adapted to rotate the work holder, cams and eccentric synchronously.

18. In a lathe the combination of a frame, a carriage guided on the frame and provided with a rotary work holder, means for feeding the carriage, a cylindrical bar mounted on the frame parallel with the carriage travel and formed with an undercut longitudinal groove, rocker arms pivotally

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of the work holder, a stationary guide engaging said arm at its other end, an oscillatory tool holder mounted on the rocker arm with its axis opposite and parallel with the axis of the work holder and provided with a cutting tool having its point at the center of oscillation, a cam adapted to move the rocker arm transversely to the work, a cam adapted to oscillate the tool holder and maintain the tool at the proper angle to the work, and means for rotating the work holder and cams synchronously.

10. In a lathe the combination of an oscillatory tool holder, an angularly adjustable segmental toothed cutting tool pivotally mounted in the tool holder with its periphery intersecting the axis of oscillation of the tool holder, and an adjusting screw swiveled in the tool holder transversely to the tool pivot and engaging the teeth of the tool.

11. In a lathe the combination of an oscillatory tool holder, and a segmental tool angularly adjustable in said holder on an axis inclined to the axis of the holder, and having a radial cutting edge terminating with its periphery at the center of oscillation of the holder.

12. In a lathe the combination of a frame, a work carriage guided thereon, means for feeding the carriage, a head stock mounted on the carriage, a rotary spindle journaled in the head stock and provided at one end with a centering work holder and at the other with a driving connection, a tail stock adjustable on the carriage towards and from the head stock and provided with an axially adjustable center in axial alignment with the spindle, tool supporting members movable transversely to the carriage, oscillatory tool holders mounted on said supporting members and provided with cutting tools, work shaping and tool adjusting cams, and means for rotating the work holder and cams synchronously.

13. In a lathe the combination of a frame, a carriage mounted thereon and provided with a rotary work holder, means for feeding the carriage, a bar mounted on the frame, rocker arms pivotally mounted on said bar, cutting tools carried by said arms and movable therewith transversely to the path of the carriage, cams adapted to shift the arms with the tools relative to the work for producing the desired shapes of parts on which the tools operate, and means for rotating the work holder and cams synchronously.

14. In a lathe the combination of a frame, a carriage mounted thereon and provided with a rotary work holder, means for feeding the carriage, a stationary bar mounted on the frame, rocker arms pivotally mounted on said bar and movable transversely to the carriage travel, oscillatory tool holders carried by said arms and provided with cutting tools having their points at the center of oscillation of the tool holders, levers pivoted on the rocker arms and geared with the tool holders, a shaft provided with tool shifting and tilting cams adapted to actuate said rocker arms and levers, and means for rotating the work holder and cam shaft synchronously.

15. In a lathe the combination of a frame, a carriage guided thereon and provided with a rotary work holder, means for feeding the carriage, rocker arms pivotally mounted on an axis parallel with the carriage travel and separately adjustable lengthwise of said axis, angularly adjustable cutting tools carried by the rocker arms, a shaft parallel with the pivot axis of the rocker arms and provided with tool shifting and tilting cams adjustable lengthwise thereof, and means for rotating the tool holder and cam shaft synchronously.

16. In a lathe the combination of a frame, a carriage guided thereon and provided with a rotary work holder, means for feeding the carriage, rocker arms pivotally mounted on the frame and provided with cutting tools movable therewith transversely to the travel of the carriage, cams for swinging the rocker arms, a shaft on which the cams are assembled removably mounted on the frame, and transmission gearing adapted to rotate the work holder and cam shaft synchronously and having a driving member with which the cam shaft is coaxially and detachably connected.

17. In a lathe the combination of a frame, a carriage guided on the frame and provided with a rotary work holder, means for feeding the carriage, tool supports movable transversely to the carriage travel, angularly movable tools carried by said supports, cams for shifting said supports with the tools relative to the work, cams for varying the angular relation of the tools to said supports, a saddle slidably mounted and guided on the carriage lengthwise thereof, a tool holder guided and movable on the saddle transversely to the carriage travel, an eccentric mounted on said saddle and connected with the tool holder, means for holding said saddle in a fixed position relative to the carriage, and transmission gearing adapted to rotate the work holder, cams and eccentric synchronously.

18. In a lathe the combination of a frame, a carriage guided on the frame and provided with a rotary work holder, means for feeding the carriage, a cylindrical bar mounted on the frame parallel with the carriage travel and formed with an undercut longitudinal groove, rocker arms pivotally mounted on said bar, guide blocks engaging said arms and adjustably fastened by bolts in the groove of the bar, a guide rail fixed

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on the frame parallel with said bar and formed with an undercut longitudinal groove, guides engaging the rocker arms and adjustably fastened by bolts in the groove of the guide rail, cutting tools adjustably mounted on the rocker arms and movable therewith transversely to the path of the carriage, cams arranged to actuate the rocker arms and shift the tools transversely to the travel of the carriage, and means for rotating the work holder and cams synchronously.

19. In a lathe the combination of a frame, a carriage mounted thereon and provided with a rotary work holder, a rotary screw parallel with the axis of the work holder for feeding the carriage, tool supporting members movable transversely to the travel of the carriage and provided with cutting tools, a shaft provided with cams for shifting the tool supporting members and tools transversely to the carriage travel, transmission gearing adapted to rotate the work holder and cam shaft synchronously, and comprising a screw actuating member, and a clutch for operatively connecting said member with the transmission gearing.

20. In a lathe the combination of a frame, a carriage mounted thereon and provided with a rotary work holder, tool supporting members movable transversely to the travel of the carriage and provided with cutting tools, cams for actuating said tool supporting members, a tool base slidably mounted on the carriage lengthwise thereof, a transversely movable tool slide and holder mounted on said base, an eccentric mounted on said base and connected with the tool slide and holder, and transmission gearing adapted to rotate the work holder and cams synchronously, and comprising a driving member for said eccentric, and a shaft connecting the eccentric with the transmission gearing parallel with the carriage travel and having an angularly adjustable connection with its driving member.

21. In a lathe the combination of a frame, a carriage mounted thereon and provided with a rotary spindle and work holder, a screw for feeding the carriage, tool supporting members movable transversely to the carriage travel and provided with cutting tools, a cam shaft arranged parallel with the carriage travel and provided with cams for operating the tool supporting members, transmission gearing adapted to rotate the work holder and cams synchronously and comprising driving members for the work holder, feed screw and cams, the driving member for the work holder having an axially sliding connection with the spindle, supporting members movable transversely to the travel of the carriage and provided with cutting tools, cams for actuating the tool supporting members, transmission gearing comprising a main driving member and adapted to rotate the work holder and cams synchronously and to feed the carriage, means for manually traversing the carriage in either direction, means for controlling the operation of the work holder and cams, and manually operated means for connecting the carriage with the transmission gearing independently of the work holder and cams.

23. In a lathe the combination of a carriage provided with a rotary work holder, supporting members movable transversely to the travel of the carriage and provided with cutting tools, tool shifting cams adapted to actuate said supporting members, means for rotating the work holder and cams synchronously, carriage feeding mechanism, and automatic means for stopping the carriage at a predetermined point in its traverse.

24. In a lathe the combination of a carriage provided with a rotary work holder, supporting members movable transversely to the travel of the carriage and provided with cutting tools, tool shifting cams adapted to actuate said supporting members, means for rotating the work holder and cams synchronously, carriage feeding mechanism, and adjustable means adapted to automatically stop the feed of the carriage at different points in its traverse.

25. In a lathe the combination of a carriage provided with a rotary work holder, supporting members movable transversely to the travel of the carriage and provided with cutting tools, tool shifting cams adapted to actuate said supporting members, means for rotating the work holder and cams synchronously, a screw for feeding the carriage, a screw driving member, a clutch for operatively connecting the screw and its driving member, means tending to disengage the clutch, means for locking the clutch in engagement, and a trip on the carriage adapted to disengage the locking means and release the clutch at a certain point in the traverse of the carriage.

26. In a lathe the combination of a carriage provided with a rotary work holder, supporting members movable transversely to the travel of the carriage and provided with cutting tools, cams for actuating the tool supporting members and shifting the tools relative to the work, means for rotating the work holder and cams synchronously, a rotary driving member, a feed screw for transversing the carriage, a clutch

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on the frame parallel with said bar and formed with an undercut longitudinal groove, guides engaging the rocker arms and adjustably fastened by bolts in the groove of the guide rail, cutting tools adjustably mounted on the rocker arms and movable therewith transversely to the path of the carriage, cams arranged to actuate the rocker arms and shift the tools transversely to the travel of the carriage, and means for rotating the work holder and cams synchronously.

19. In a lathe the combination of a frame, a carriage mounted thereon and provided with a rotary work holder, a rotary screw parallel with the axis of the work holder for feeding the carriage, tool supporting members movable transversely to the travel of the carriage and provided with cutting tools, a shaft provided with cams for shifting the tool supporting members and tools transversely to the carriage travel, transmission gearing adapted to rotate the work holder and cam shaft synchronously, and comprising a screw actuating member, and a clutch for operatively connecting said member with the transmission gearing.

20. In a lathe the combination of a frame, a carriage mounted thereon and provided with a rotary work holder, tool supporting members movable transversely to the travel of the carriage and provided with cutting tools, cams for actuating said tool supporting members, a tool base slidably mounted on the carriage lengthwise thereof, a transversely movable tool slide and holder mounted on said base, an eccentric mounted on said base and connected with the tool slide and holder, and transmission gearing adapted to rotate the work holder and cams synchronously, and comprising a driving member for said eccentric, and a shaft connecting the eccentric with the transmission gearing parallel with the carriage travel and having an angularly adjustable connection with its driving member.

21. In a lathe the combination of a frame, a carriage mounted thereon and provided with a rotary spindle and work holder, a screw for feeding the carriage, tool supporting members movable transversely to the carriage travel and provided with cutting tools, a cam shaft arranged parallel with the carriage travel and provided with cams for operating the tool supporting members, transmission gearing adapted to rotate the work holder and cams synchronously and comprising driving members for the work holder, feed screw and cams, the driving member for the work holder having an axially sliding connection with the spindle, and a clutch for connecting and disconnecting the feed screw and its driving member.

22. In a lathe the combination of a carriage provided with a rotary work holder, supporting members movable transversely to the travel of the carriage and provided with cutting tools, cams for actuating the tool supporting members, transmission gearing comprising a main driving member and adapted to rotate the work holder and cams synchronously and to feed the carriage, means for manually traversing the carriage in either direction, means for controlling the operation of the work holder and cams, and manually operated means for connecting the carriage with the transmission gearing independently of the work holder and cams.

23. In a lathe the combination of a carriage provided with a rotary work holder, supporting members movable transversely to the travel of the carriage and provided with cutting tools, tool shifting cams adapted to actuate said supporting members, means for rotating the work holder and cams synchronously, carriage feeding mechanism, and automatic means for stopping the carriage at a predetermined point in its traverse.

24. In a lathe the combination of a carriage provided with a rotary work holder, supporting members movable transversely to the travel of the carriage and provided with cutting tools, tool shifting cams adapted to actuate said supporting members, means for rotating the work holder and cams synchronously, carriage feeding mechanism, and adjustable means adapted to automatically stop the feed of the carriage at different points in its traverse.

25. In a lathe the combination of a carriage provided with a rotary work holder, supporting members movable transversely to the travel of the carriage and provided with cutting tools, tool shifting cams adapted to actuate said supporting members, means for rotating the work holder and cams synchronously, a screw for feeding the carriage, a screw driving member, a clutch for operatively connecting the screw and its driving member, means tending to disengage the clutch, means for locking the clutch in engagement, and a trip on the carriage adapted to disengage the locking means and release the clutch at a certain point in the traverse of the carriage.

26. In a lathe the combination of a carriage provided with a rotary work holder, supporting members movable transversely to the travel of the carriage and provided with cutting tools, cams for actuating the tool supporting members and shifting the tools relative to the work, means for rotating the work holder and cams synchronously, a rotary driving member, a feed screw for transversing the carriage, a clutch for connecting the feed screw with said driving member, and a clutch controlling trip adjustable on the carriage in the direction of its travel and adapted to automatically stop

the feed screw at a variable point in the traverse of the carriage.

27. In a lathe the combination of a carriage provided with a rotary work holder, supporting members movable transversely to the travel of the carriage and provided with cutting tools, cams adapted to actuate the tool supporting members and to shift the tools relative to work on the carriage, a feed screw for traversing the carriage, transmission gearing comprising a main and auxiliary driving members for the work holder, cams and feed screw, a clutch controlling the connection of the auxiliary driving members with the main driving member, a second clutch controlling the connection of the feed screw with one of the auxiliary driving members, means for manually engaging the clutches separately, and a clutch controlling trip adapted to release both clutches at a predetermined point in the traverse of the carriage.

28. In a lathe the combination of a rotary work holder, a tool supporting member movable transversely to the axis of the work holder, a tool holder mounted and angularly adjustable on said member, work-shaping and tool-adjusting cams cooperating with the tool supporting member and tool holder to vary the distance between the tool and the axis of the work holder and to maintain the proper angular relation of the tool to the work, and means for rotating the work holder and cams synchronously.

29. In a structure of the class described, the combination of a tool support, a tool mounted on said support for swinging movement, a pattern cam corresponding to the shape of the cam to be cut for controlling said support, and means for swinging said tool whereby its cutting position relative to the work is maintained as the work revolves.

30. In a structure of the class described, the combination of a tool support, a tool mounted on said support for swinging movement, a pattern cam for the cam to be cut, said pattern cam being adapted to control said support, and means for swinging said tool in such wise as to maintain the same in proper cutting position relative to the work as the latter revolves.

31. In a machine of the character described, the combination of a tool support, a tool mounted on said support for angular movement relatively thereto, and means for moving said support and said tool in such wise as to cause the latter to produce a body of irregular form.

32. In a machine of the character described, the combination of a tool support, a tool mounted on said support for angular movement relatively thereto, and cams for

33. In a machine of the character described, the combination of a work holder, a tool support movable transversely to the axis of the work holder, a tool holder mounted on said support for angular movement relatively thereto, a tool carried by said holder, means for moving said support and said tool holder in such wise as to cause said tool to produce a body of irregular form, and means for actuating said first-mentioned means in synchronism with the rotary movements of the work holder.

34. In a machine of the character described, the combination of a rotary work holder, a tool support movable transversely to the axis of the work holder, a tool holder mounted on said support for angular movement relatively thereto, a tool carried by said holder, cams for moving said support and said tool holder in such wise as to cause said tool to produce a body of non-circular form, and means for actuating said cams in synchronism with the rotary movements of the work holder.

35. In a lathe, the combination of a movable tool support, a tool tiltably mounted on said support, and cams for moving said support and tool respectively for causing the latter to delineate a predetermined contour of non-circular form.

36. In a lathe, the combination of a movable tool support, a tool tiltably mounted on said support, and means for moving said support and tool respectively for causing the latter to delineate a predetermined contour of irregular form.

37. In a machine of the character described, the combination of a movable tool support, a tool mounted on said support for movement relatively thereto, a cam for controlling said support, and means for moving said tool angularly so as to prevent the same from assuming a non-cutting position relative to the work as the latter revolves.

38. The method of cutting an irregular form, consisting in bodily shifting a single point cutting tool toward and from the work and angularly tilting said tool relatively to its bodily shifting movement to retain the effective cutting position of the tool relative to the work during the cutting of the irregular form.

39. In a lathe, the combination of a work holder, a tool support movable in a plane transverse to the axis of the work holder, a spring urging said support in one direction, a cam acting to move said support in the opposite direction against the action of said spring, a tool holder pivotally mounted on said tool support, and a control cam for said tool holder adapted to swing the tool in synchronism with the movement of the support

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the feed screw at a variable point in the traverse of the carriage.

27. In a lathe the combination of a carriage provided with a rotary work holder, supporting members movable transversely to the travel of the carriage and provided with cutting tools, cams adapted to actuate the tool supporting members and to shift the tools relative to work on the carriage, a feed screw for traversing the carriage, transmission gearing comprising a main and auxiliary driving members for the work holder, cams and feed screw, a clutch controlling the connection of the auxiliary driving members with the main driving member, a second clutch controlling the connection of the feed screw with one of the auxiliary driving members, means for manually engaging the clutches separately, and a clutch controlling trip adapted to release both clutches at a predetermined point in the traverse of the carriage.

28. In a lathe the combination of a rotary work holder, a tool supporting member movable transversely to the axis of the work holder, a tool holder mounted and angularly adjustable on said member, work-shaping and tool-adjusting cams cooperating with the tool supporting member and tool holder to vary the distance between the tool and the axis of the work holder and to maintain the proper angular relation of the tool to the work, and means for rotating the work holder and cams synchronously.

29. In a structure of the class described, the combination of a tool support, a tool mounted on said support for swinging movement, a pattern cam corresponding to the shape of the cam to be cut for controlling said support, and means for swinging said tool whereby its cutting position relative to the work is maintained as the work revolves.

30. In a structure of the class described, the combination of a tool support, a tool mounted on said support for swinging movement, a pattern cam for the cam to be cut, said pattern cam being adapted to control said support, and means for swinging said tool in such wise as to maintain the same in proper cutting position relative to the work as the latter revolves.

31. In a machine of the character described, the combination of a tool support, a tool mounted on said support for angular movement relatively thereto, and means for moving said support and said tool in such wise as to cause the latter to produce a body of irregular form.

32. In a machine of the character described, the combination of a tool support, a tool mounted on said support for angular movement relatively thereto, and cams for moving said support and said tool in such wise as to cause the latter to produce a body of non-circular form.

33. In a machine of the character described, the combination of a work holder, a tool support movable transversely to the axis of the work holder, a tool holder mounted on said support for angular movement relatively thereto, a tool carried by said holder, means for moving said support and said tool holder in such wise as to cause said tool to produce a body of irregular form, and means for actuating said first-mentioned means in synchronism with the rotary movements of the work holder.

34. In a machine of the character described, the combination of a rotary work holder, a tool support movable transversely to the axis of the work holder, a tool holder mounted on said support for angular movement relatively thereto, a tool carried by said holder, cams for moving said support and said tool holder in such wise as to cause said tool to produce a body of non-circular form, and means for actuating said cams in synchronism with the rotary movements of the work holder.

35. In a lathe, the combination of a movable tool support, a tool tiltably mounted on said support, and cams for moving said support and tool respectively for causing the latter to delineate a predetermined contour of non-circular form.

36. In a lathe, the combination of a movable tool support, a tool tiltably mounted on said support, and means for moving said support and tool respectively for causing the latter to delineate a predetermined contour of irregular form.

37. In a machine of the character described, the combination of a movable tool support, a tool mounted on said support for movement relatively thereto, a cam for controlling said support, and means for moving said tool angularly so as to prevent the same from assuming a non-cutting position relative to the work as the latter revolves.

38. The method of cutting an irregular form, consisting in bodily shifting a single point cutting tool toward and from the work and angularly tilting said tool relatively to its bodily shifting movement to retain the effective cutting position of the tool relative to the work during the cutting of the irregular form.

39. In a lathe, the combination of a work holder, a tool support movable in a plane transverse to the axis of the work holder, a spring urging said support in one direction, a cam acting to move said support in the opposite direction against the action of said spring, a tool holder pivotally mounted on said tool support, and a control cam for said tool holder adapted to swing the tool in synchronism with the movement of the support and the rotation of the work.

40. In a lathe, the combination of a rotary work holder, a supporting member mov-

able transversely to the axis of the work holder, a spring acting on said supporting member to urge the same in one direction, a cam controlling the movement of said supporting member against the action of said spring, a tool holder mounted on said supporting member for swinging adjustment with respect thereto, an actuating cam therefor, and means for synchronously rotating said work holder and cams.

41. In a cam turning machine, a tool support, a single point cutting tool mounted on said support, means to move said tool toward and from the cam blank and to tilt the same to keep the cutting edge at an effective angle relative to the work to cut an irregular outline on the cam blank.

42. The combination of work holding means, a single point cutting tool, a support therefor automatically movable toward and from the axis of the holding means, means for moving said support and means for tilting said tool on said support.

In witness whereof we hereto affix our signatures.

CHARLES GORDON.
ALFRED W. REDLIN.

DISCLAIMER

1,542,803.—*Charles Gordon*, Milwaukee, Wis., and *Alfred W. Redlin*, Saginaw, Mich. LATHE. Patent dated June 16, 1925. Disclaimer filed February 24, 1930, by the patentees and the assignee by mesne assignments, *The Gordon Form Lathe Company*.

Hereby enter this disclaimer and disclaim from the scope of claims 23 and 24 of said patent all lathes and other machine tools, except those employing single-point cutting tools for the turning of irregular or non-geometric forms out of metal.

[*Official Gazette March 25, 1930.*]

PLAINTIFF'S EXHIBIT 5

In the District Court of the United States
Eastern District of Michigan

The Gordon Form Lathe Company,
Plaintiff,

vs.

Walcott Machine Company, formerly Walcott Lathe Company,
Defendant,

By: Simons, J.
In Equity
No. 1644

AMENDED FINAL DECREE

Appeal having been allowed from the decree of this Court entered October 20, 1927, to the United States Circuit Court of Appeals for the Sixth Circuit, such appeal having been heard and disposed of by said Court of Appeals, and the mandate having come down to this Court, and such Court of Appeals having reversed this Court on the question of non-infringement, it is hereby ordered, adjudged and decreed as follows:

(1) That the decree of this Court entered October 20, 1927, dismissing said Bill of Complaint with costs to Defendant is hereby vacated.

(2) That Letters Patent of the United States to Charles Gordon and Alfred W. Redlin, No. 1,542,803, dated June 16, 1925, for Lathe is good and valid in law as to claims 1, 2, 28, 29, 30, 33, 34, 39, 40, 41 and 42 thereof.

(3) That the said Charles Gordon and Alfred W. Redlin named in the said patent were the first, true, original and joint inventors of the inventions, improvements and combinations described in said patent and in said claims.

(4) That the Plaintiff, the Gordon Form Lathe Company, is the lawful owner of the entire right, title and interest in and to said inventions, and in and to said Letters Patent, 1,542,803.

(5) That the Defendant, Walcott Machine Company, formerly Walcott Lathe Company, has infringed upon said Letters Patent, and particularly upon the above named claims thereof by constructing, or causing to be constructed and/or by using and/or by selling, or causing to be sold, within the Eastern District of Michigan, Southern Division, and elsewhere in the United States, machines or lathes embodying the inventions set forth in the said claims of said patent.

(6) It being represented to the Court that the Defendant is not financially able to respond to a money judgment for damages and/or profits, no accounting is ordered, but on the contrary it is ordered that the Plaintiff recover of the Defendant nominal damages in the sum of One Dollar ($1.00), without reference to a Master.

(7) That an injunction be issued out of and under the seal of this Court directed to Defendant, Walcott Lathe Company, each of its directors, officers, attorneys, servants, agents, clerks, employees and workmen, and all their privies, and each and everyone of them enjoining and restraining them, during and throughout the remainder of the term of said Letters Patent No. 1,542,803, from directly or indirectly constructing, causing to be constructed, and/or using and/or selling, or causing to be used or sold, or advertising for sale, without the written license and consent of the Plaintiff, lathes like Defendant's cam turning and crank shaft contour lathes illustrated and described in the patent application of Herman W. Melling, Serial No. 416,750, filed October 13, 1920, and in Plaintiff's Exhibits K and M, respectively, and any other lathe, machine, apparatus, article, device or parts

and/or combinations containing, employing or embodying said inventions and improvements described in said Letters Patent No. 1,542,803, and particularly referred to in claims 1, 2, 28, 29, 30, 33, 34, 39, 40, 41 and 42 thereof, or any of them, or any lathe, machine, apparatus, article, device, or parts intended to be used, or capable only of use, in a combination infringing said patent, and from infringing, or contributing to infringements upon, or in violation of said Letters Patent in any way whatsoever.

(8) That Plaintiff do recover of the Defendant Four Thousand Dollars ($4,000.00) as its costs in this Court and the Court of Appeals and judgment may be had against the Defendant for such Four Thousand Dollars ($4,000.00).

(9) That all bonds filed in this cause be discharged and that the Clerk of this Court so notify the bonding companies.

(10) That complaint is dismissed without prejudice as to claims 12, 23 and 24.

(Sgd.) Charles C. Simons,
United States District Judge.

Detroit, Michigan, June 24, 1929.

PLAINTIFF'S EXHIBIT 40

Bottum, Hudnall, Lecher & McNamara

(Letterhead.)

Milwaukee, Wis.
July 1, 1925.

To Whom It May Concern:

Subject: Infringement of Patent No. 1,542,803, Improvement in Lathes.

Representing our client, The Gordon Form Lathe Co., we beg to call your attention to the fact that, on June 16, 1925, the United States Patent Office issued a patent, of that date, No. 1,542,803, to the Gordon Form Lathe Co., as assignee of the applicants, Charles Gordon and Alfred W. Redlin. This patent was applied for July 19, 1920, but its issue was delayed by a strenuously conducted interference proceeding in the Patent Office. The contestant took every appeal allowable in the Patent Office, including the Court of Appeals for the District of Columbia, and each and every proceeding was decided in favor of complete recognition of all the Gordon and Redlin claims.

Forty-two claims were allowed, and they cover the invention very broadly, even to the extent of the method of turning irregular forms with a single point cutting tool.

The Gordon Form Lathe Co., owners of this patent, are willing to arrange terms with users of infringing machines on a reasonable basis, and invite correspondence through this office with reference to same; otherwise it will be necessary for us to institute suits for infringement, in which we shall apply for and expect to obtain

proper injunctions against continued infringements. This is not stated as a threat, but as a plain statement of our client's legal position, and the extension of the olive branch of peace to all who will recognize the just rights of our clients.

If interested, please let us hear from you as promptly as practicable.

Very truly yours,

Bottum, Hudnall, Lecher & McNamara.

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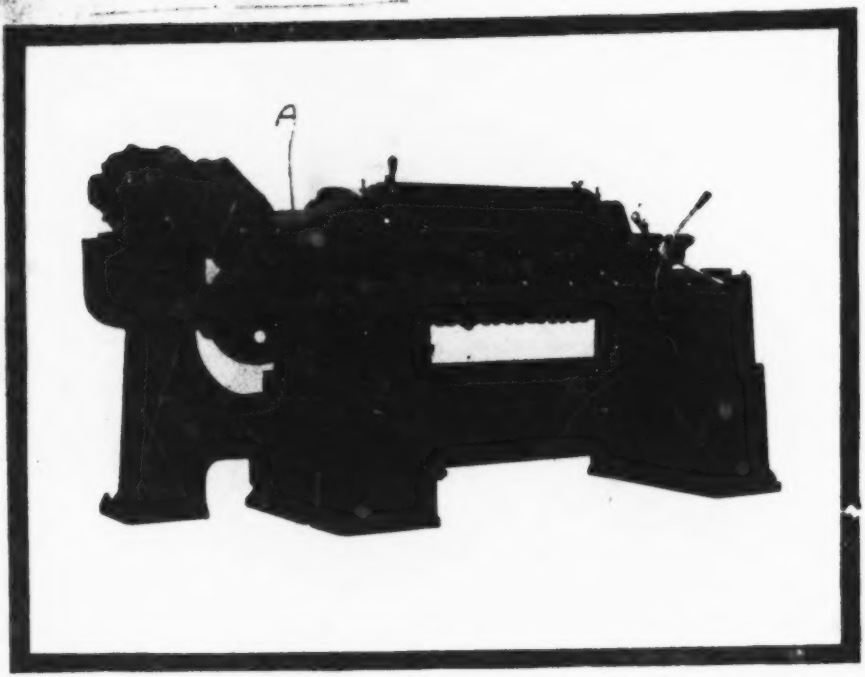


Melling Cam Turning Lathe

THE GORDON FORM LATHE COMPANY
- VS -
FORD MOTOR COMPANY
IN EQUITY NO. 4664
PLAINTIFF'S EXHIBIT No. 41

Manufactured by

Walcott Lathe Company

Jackson, Michigan

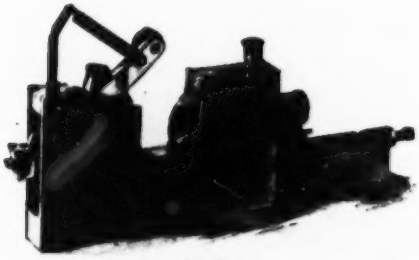


Fig. 1
Cutting Tool Assembly Complete

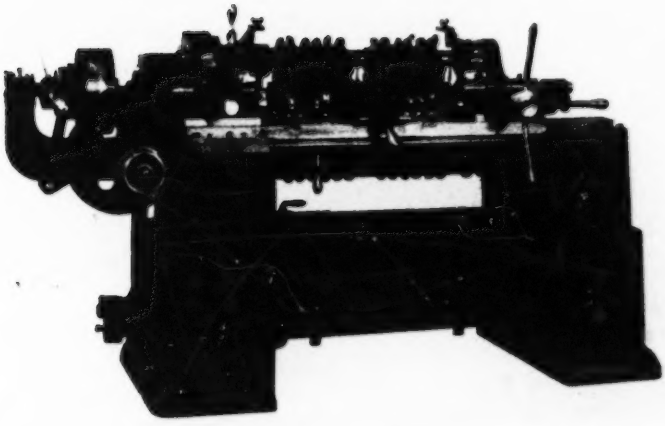


Fig. 2
Front view of Milling Cam Turning Lathe adapted to belt drive

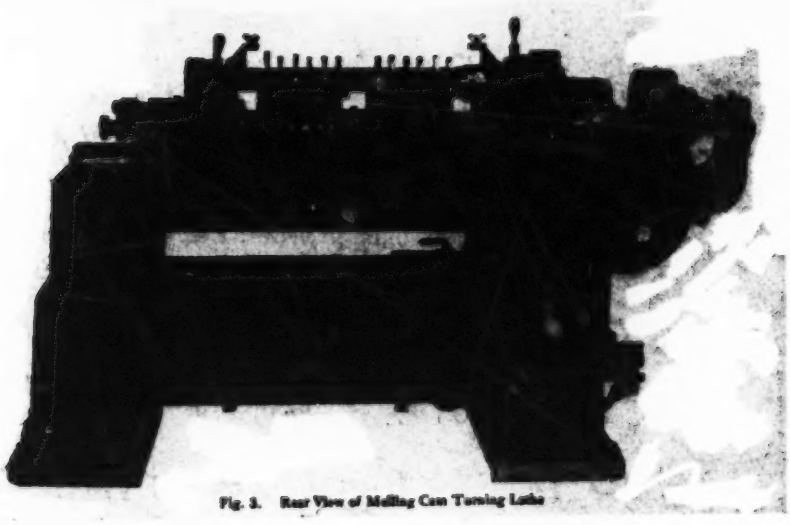


Fig. 3. Rear View of Milling Cam Turning Lathe

PLAINTIFF'S EXHIBIT 42

TRACTOR MANUFACTURERS

Advance-Rumely Thresher Co., LaPorte, Ind.
Allied Truck & Tractor Co., Minneapolis, Minn.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Aultman & Taylor Machinery Co., Mansfield, Ohio.
Austin Mfg. Co., 400 N. Michigan Ave., Chicago, Ill.
Avery Co., Peoria, Ill.
Bates Machine & Tractor Co., Joliet, Ill.
Bates Tractor Co., Lansing, Mich.
C. L. Best Tractor Co., San Leandro, Cal.
Blumberg Motor Mfg. Co., San Antonio, Tex.
Bryan Harvester Co., Peru, Ind.
Buckeye Mfg. Co., Anderson, Ind.
Massey-Harris Co., Racine, Wis.
J. I. Case Threshing Machine Co., Racine, Wis.
Cleveland Tractor Co., Cleveland, Ohio.
Dart Truck & Tractor Corp., Waterloo, Ia.
Dayton-Dowd Co., Quincy, Ill.
Deere & Co., Moline, Ill.
Depue Bros. Mfg. Co., Clinton, Ia.
Eagle Mfg. Co., Appleton, Wis.
Electric Wheel Co., Quincy, Ill.
Emerson-Brantingham Impl. Co., Rockford, Ill.
Fageol Motors Co., Oakland, Cal.
Ford Motor Co., Detroit, Mich.
Hart-Parr Co., Charles City, Ia.
Holt Mfg. Co., Inc., Peoria, Ill. and Stockton, Cal.
International Harvester Co., Chicago, Ill.
Keystone Iron & Steel Works, Los Angeles, Cal.
Kinnard & Sons Mfg. Co., Minneapolis, Minn.
John Lauson Mfg. Co., New Holstein, Wis.
Massey-Harris Co., Ltd., Toronto, Ontario, Canada.
Midwest Engine Co., Indianapolis, Ind.
Minneapolis Steel & Machinery Co., Minneapolis, Minn.
Minneapolis Threshing Machine Co., Hopkins, Minn.

Moline Plow Co., Moline, Ill.
Monarch Tractors, Watertown, Wis., Division of Allis Chalmers Co., Springfield, Ill.
Nichols & Shepard Co., Battle Creek, Mich.
Rock Island Plow Co., Rock Island, Ill.
The Russell & Co., Massillon, Ohio.
Square Turn Tractor Co., Norfolk, Neb.
Stockton Tractor Co., Stockton, Cal.
Topp-Stewart Tractor Co., Clintonville, Wis.
Toro Mfg. Co., Minneapolis, Minn.
Velie Motors Corporation, Moline, Ill.
Wichita Motors Co., Wichita Falls, Texas.

Automobiles

Passenger, Touring, etc., Gasoline

Conn.: Bridgeport,
Locomobile Co. of America, Inc.
Ill.: Chicago,
Yellow Cab Mfg. Co., 5801 Dickens Ave.
Ill.: East Moline,
R. & V. Motor Co.
Ind.: Auburn,
Auburn Automobile Co.
Ind.: Connersville,
Lexington Motor Co.
McFarlan Motor Corp.
Ind.: Elkhart,
Elcar Motor Co.
Ind.: Evansville,
Hercules Corp.
Ind.: Indianapolis,
Bull Tractor-Madison Motors Corp.
Duesenberg Automobile & Motors Co., Washington & Harding Sts.
H. C. S. Motor Car Co., 1411 N. Capitol.
National Motors Corp., 22nd & Monon R. R.

Nordyke & Marmon Co., 1101 W. Morris.
Stutz Motor Car Co. of America, Inc., Capitol Ave. & 10th.

Ind.: Kokomo,
Apperson Bros. Automobile Co.
Haynes Automobile Co.

Ind.: Richmond,
Davis Motor Car Co., Geo. W.

Ind.: South Bend,
Studebaker Corp.

Ky.: Louisville,
Ky. Wagon Mfg. Co., 3d & "K" Sts.

Mass.: Brockton,
Sterling Motor Car Co.

Mass.: Chicopee Falls,
Rauch & Lang, Inc.
Stevens-Duryea, Inc.

Mass.: Springfield,
Rolls-Royce of America, Inc.

Mich.: Detroit,
Cadillac Motor Car Co., 2860 Clark St.
Chevrolet Motor Co., General Motors Bldg.
Chrysler Motor Corp., 341 Massachusetts Ave. 7900 Jos. Campau Ave.
General Motors Corp., General Motors Bldg.
Gray Motor Corp., Mack & R. R.
Hudson Motor Co., 12601 E. Jefferson Ave.
Hupp Motor Car Corp.
Lincoln Motor Co., Warren & Livernois.
Packard Motor Car Co.
Graham-Paige Motor Car Co., McKinstry & Fort.

Mich.: Flint,
Buick Motor Co.
Flint Motor Co.

Mich.: Lansing,
Olds Motor Works.
Reo Motor Car Co.

Mich.: Marysville,
Wills Sainte Claire, Inc.
Mich.: Pontiac,
Oakland Motor Car Co.
Mo.: St. Louis,
Gardner Motor Co., Inc., Main & Rutger.
Moon Motor Car Co., 400 N. Main.
N. Y.: Buffalo,
Pierce-Arrow Motor Car Co., 1695 Elmwood Ave.
N. Y.: Long Island City,
Brewster & Co., Inc.
N. Y.: New York City,
Driggs Ordinance & Mfg. Corp., 19 W. 44th.
Durant Motors, Inc., 1819 Broadway.
Fiat Company, 150 W. 57th.
N. Y.: Rochester,
Cunningham, James, Son & Co.
N. Y.: Syracuse,
Franklin, H. H. Mfg. Co.
Ohio: Cincinnati,
Sayers & Scovill Co., Gest & B. & O. R. R.
Ohio: Cleveland,
Chandler Motor Car Co., East 131st.
Cleveland Automobile Co., Euclid Ave. & London Rd.
Jordon Motor Car Co., 1070 E. 152nd.
Peerless Motor Car Co., Quincy Ave. & East 93rd.
Rollins Motors Co., Lamb & Euclid Aves.
Stearns Co., F. B., Euclid Ave. & Lakeview Road.
Ohio: Springfield,
Westcott Motor Car Co.
Ohio: Toledo,
Willys-Overland, Inc.
Okla.: Tulsa,
Witt-Thompson Motor Co.
Pa.: Wilkes-Barre,
Owen Magnetic Motor Car Corp.
Texas: Dallas,
Little Motor Kar Co., Ltd.

Va.: Lynchburg,
Piedmont Motor Car Co.
Wis.: Hartford,
Kissel Motor Car Co.
Wis.: Kenosha,
Nash Motors Co.

Motors
Airplane, Aviation & Flying Machine

Cal.: Oakland,
Union Gas Engine Co.
Cal.: San Francisco,
Hall-Scott Motor Co., Crocker Bldg.
N. J.: Paterson,
Wright Aeronautical Corp.
N. Y.: Buffalo,
Curtiss Aeroplane & Motor Corp., 74 Kail.
N. Y.: Long Island City,
General Vehicle Co., Inc.

Motors
Gasoline, Automobile, Motor Boat, etc.

Ill.: Chicago,
Excelsior Motor Mfg. & Supply Co., 3701 Cortland.
Ill.: Harvey,
Buda Company, The.
Ind.: Anderson,
Dart Mfg. Co.
Laurel Motors Corp.
Ind.: Connersville,
Ansted Engineering Co.
Ind.: Indianapolis,
Allison Engineering Co., Main & 13th Speedway.
Showers & Umphrey, Shelby & Georgia.
Ind.: Marion,
Rutenber Motor Co.

Iowa: Clinton,
Climax Engineering Co.
Mass.: Springfield,
Knox Motors Co.
Mich.: Detroit,
Continental Motors Corp., 12301 Jefferson Ave.
Golden, Belknap & Schwarts Co., 5432 W. Grand River Ave.
Hinkley Motors, Inc., High & Benson Sts.
Kermath Mfg. Co., 5880 Commonwealth.
Northway Motor & Mfg. Co., Holbrook Ave. & G. T. R. R.
Turner & Moore Mfg. Co., 660 Merritt Ave.
Mich.: Saginaw,
Erd Motors Corp.
Wilcox Motor & Mfg. Co.
Minn.: Red Wing,
Red Wing Motor Co.
N. Y.: Buffalo,
Augustine Automatic Rotary Engine Co., 1862 Elmwood Ave.
Sterling Engine Co., 1250 Niagara.
N. Y.: North Tonawanda,
Herschell-Spillman Motor Car.
Brennan Motor Mfg. Co.
Ohio: Cleveland,
Chandler Motor Car Co.
Pa.: Pittsburgh,
Pittsburgh Model Engine Co., 7229 McPherson.
Pa.: Williamsport,
Lycoming Mfg. Co.
Wis.: Milwaukee,
Evinrude Motor Co., 805 Evinrude Block.
Wis.: Oshkosh,
Universal Motor Co.
Wis.: Port Washington,
Gilson Mfg. Co.

Motors

Marine, Launch, Boat, etc., Gasoline

Cal.: Oakland,
Standard Gas Engine Co.
Cal.: San Francisco,
Hall-Scott Motor Car Co., Crocker Bldg.
Conn.: Bridgeport,
Automatic Machine Co.
Conn.: Coscob,
Palmer Bros. Engines, Inc.
Ill.: Chicago,
Sears, Roebuck & Co., Arlington & Homan Aves.
Mich.: Detroit,
Scripps Motor Co., 5817 Lincoln Ave.
N. Y.: Buffalo,
Buffalo Gasolene Motor Co., 1280 Niagara.
Ohio: Portsmouth,
Reliable Tractor & Engine Co.

Shafts

Cam, for Gasoline Motors, etc.

Cal.: Los Angeles,
Llewellyn Iron Works, N. Main & Redondo.
Ill.: Blue Island,
Modern Die & Drop Forge Co., 1800 W. 139th St.
Ill.: Chicago,
Atlas Forgings Co., 55th Court.
Mich.: Jackson,
Jackson Motor Shaft Co.
Mich.: Muskegon,
Gordon, L. O., Mfg. Co.
Muskegon Motor Specialties Co.
N. Y.: Dunkirk,
Commercial Mach. Co., Inc.

Ohio: Alliance,
Transue & Williams Steel Forging Corp.
Ohio: Dayton,
Davis Sewing Machine Co., 470 Linden Ave.
Pa.: Sharon,
Driggs-Seabury Ordnance Co.
(Letter returned from Post Office)—wrong.

Tractor Assembly

Ill.: Rockford,
Cotta Transmission Corp.

Tractors

Ill.: Harvey,
Harvey Motor Truck Works.
Minn.: Minneapolis,
Twin City Co., 29th & Minnehaha.
N. Y.: Canastota,
Watson Wagon Co.
Ohio: Cleveland,
Lakewood Engineering Co., Berea Rd.

Motor Manufacturers

Automatic Machine Co., Bridgeport, Conn.
Badger Gas & Gasoline Engine Co., Kansas City, Kas.
Beaver Mfg. Co., Milwaukee, Wis.
Climax Engineering Co., Clinton, Ia.
Erd Motor Co., Saginaw, Mich.
Hercules Motor Mfg. Co., Canton, O.
Hinkley Motors Inc., Ecorse, Mich.
LeRoi Co., Milwaukee, Wis.
The Matthews Engineering Co., Sandusky, O.
Stearns Motor Mfg. Co., Ludington, Mich.
Waukesha Motor Co., Waukesha, Wis.
Wisconsin Motor Mfg. Co., Milwaukee, Wis.
Wellman Seaver Morgan Co., Motor Division, Cleveland, O.

DEFENDANT'S EXHIBIT 48

THE GORDON FORM LATHE CO.
170-22nd Street
Milwaukee, Wis.

Chas. Gordon
Pres. & Treas.

June 12, 1929

Ford Motor Company,
Detroit, Michigan.

Gordon & Redlin Patent 1,542,803,
June 16, 1925—Lathe

Gentlemen:

Under date of July 1, 1925, you were formally notified of the issuance of the above patent and of your infringement thereof. Since then as you undoubtedly know this patent has been in litigation. We now repeat this notice to you and again call your attention to the fact of your infringement.

In this connection, we enclose copy of the decision (dated April 12th, 1929) of the United States Circuit Court of Appeals for the Sixth Circuit in the case of the Gordon Form Lathe Co. v. Walcott Machine Co. The machines held to infringe the Gordon patent are the cam turning and crank shaft contour lathes manufactured by the Walcott Machine Co. of Jackson, Michigan. To much the same effect, in our view, as the decision of the Court of Appeals for the Sixth Circuit, is the decision of the Court of Appeals for the District of Columbia recorded in 4 Fed. (2d) 945 and that of Judge Westenhaver recorded in 14 Fed. (2d) 437.

We have made the National Automobile Chamber of Commerce the following offer:—

"(a) For the past we are willing to accept ¾c a cam and 1½c a crank cheek for each cam and each cheek respectively that has been turned by any of your members on any infringing machine, and

(b) For the future we are willing to release any infringing machine for the sum of $4,000.00 per machine.

We are willing at this time to accept settlement in accordance with the above for either the past or the future or both, but with the understanding, of course, that there will be no waiver of any claim we may have for the past if settlement for only the future is tendered, and vice versa."

If you are, or if you are not, a member of the National Automobile Chamber of Commerce, we would be willing to deal with your company direct on the same basis.

Unless prompt settlement is made, we shall be forced to proceed against you for an injunction and an accounting. Since the royalties and the settlement we offer are only a small percentage of the actual savings realized, or realizable, through the use of these machines (and it is our understanding of the law that we are entitled to all of the savings made by the use of these machines as compared with the old grinding method if we proceed to an accounting), we will leave this offer open to you for a limited time only.

We are informed that the Walcott Co. is now offering the industry slightly modified tool operating units, substantially as shown in Melling patent 1,634,550, for replacement of the units of the machines now in use. In the opinion of our Counsel, these units also constitute a clear infringement of the Gordon patent, especially some of the very claims thereof which were sustained

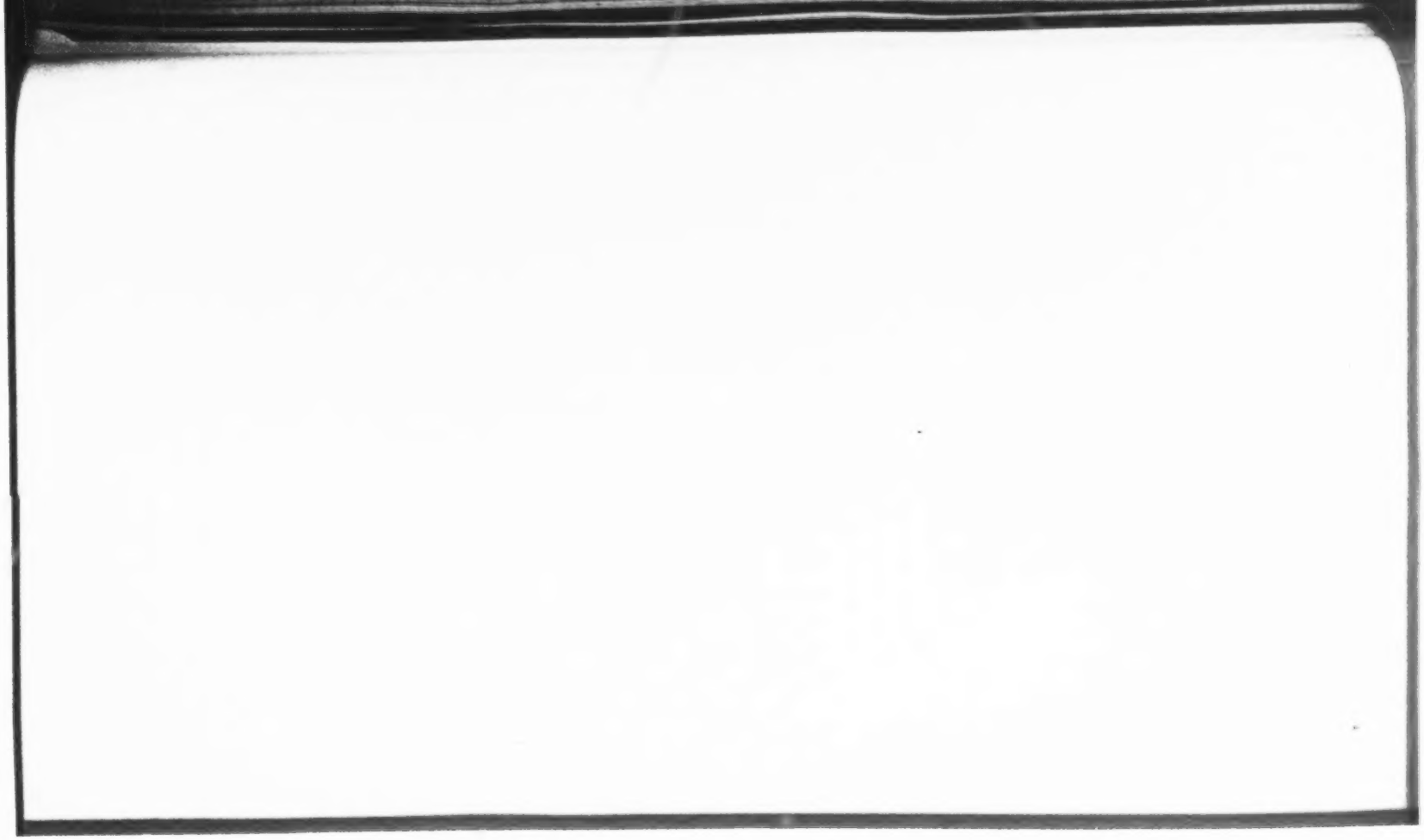
by the Court of Appeals of the Sixth Circuit, and we will proceed against all users of such machines under the Gordon and Redlin patent. For your future guidance, therefore, we also include notice to this effect at this time in order that you may be fully informed as to our position.

In the latter connection, we call your attention to such statements as the following in the enclosed copy of the opinion of the Sixth Circuit Court of Appeals:

> "The present patent is in a very true sense generic and the patentee a pioneer in this particular branch of the art."
>
> * * * * *
>
> "The patent is considered by us as a primary or generic one and the claims are entitled to great liberality of construction."

Yours truly,

The Gordon Form Lathe Co.,
per Chas. Gordon,
Pres. and Treas.



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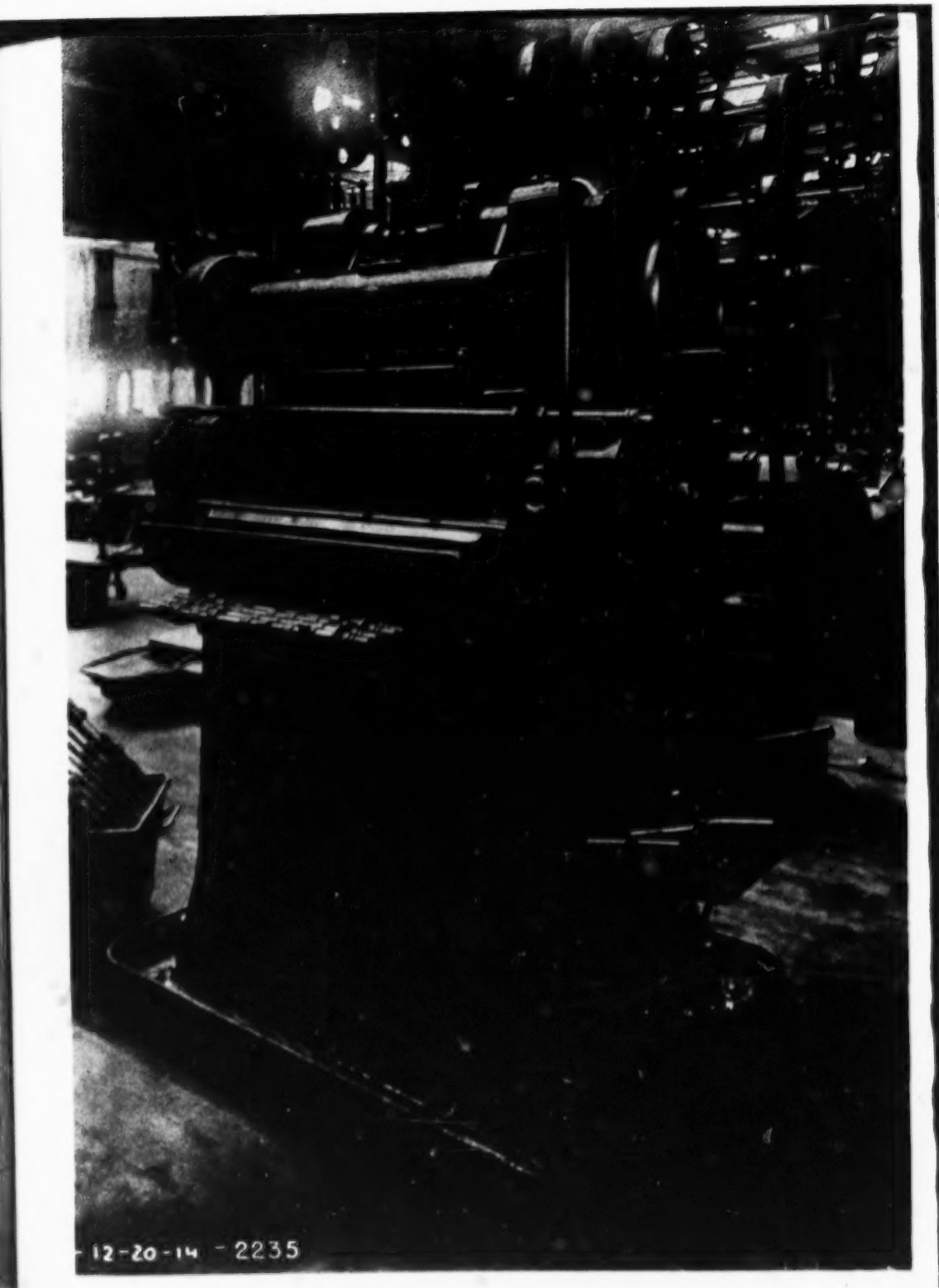

DEFENDANT'S EXHIBIT NO. 52

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DEFENDANT'S EXHIBIT NO. 53

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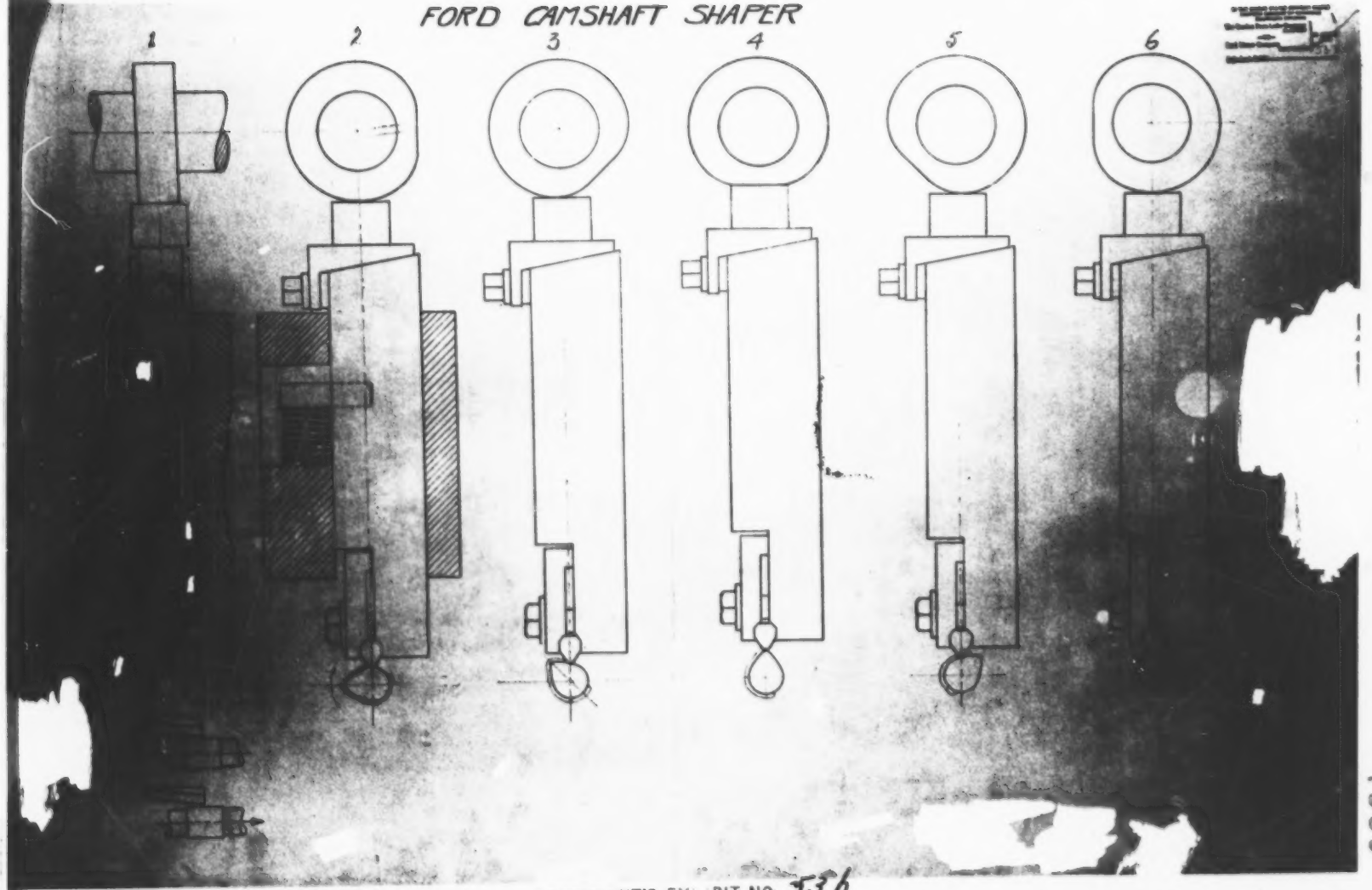
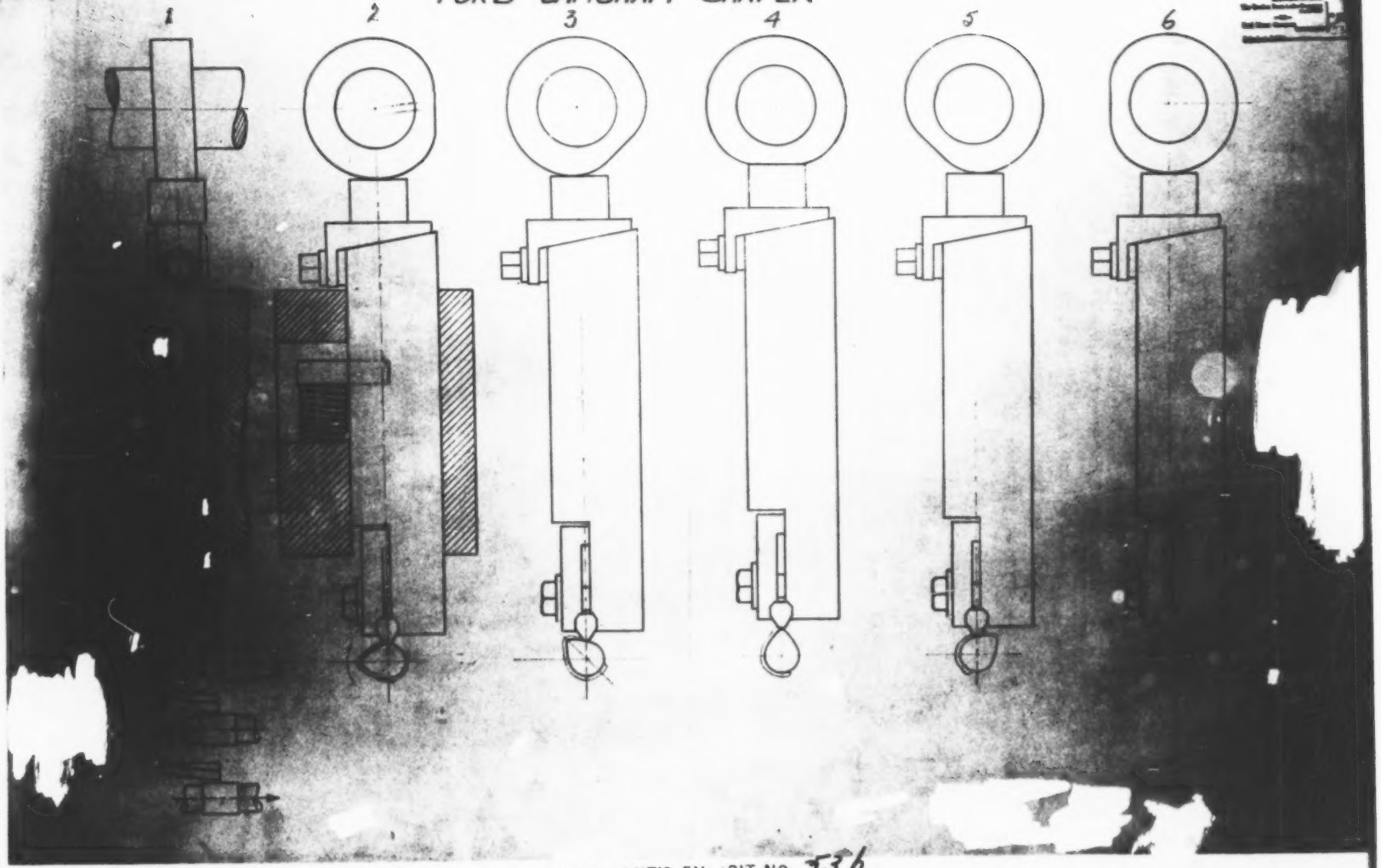
FORD CAMSHAFT SHAPER



DEFENDANT'S EXHIBIT NO. 536

538

FORD CAMSHAFT SHAPER



DEFENDANT'S EXHIBIT NO. 536

DEFENDANT'S EXHIBIT 55

Req. 11569

PERMANENT INVENTORY OF MACHINE TOOLS

Manufacturer's number Factory serial number 30236 Gordon Camshaft Turning Lathe; 2¼" swing; maximum distance between centers 36"; minimum distance between tool ars 1⅝"; spindle speeds 50 to 125 varying according to from of cam; feeds. 0046 to 008 per spindle revolution; to be arranged to turn our Tractor Camshaft F-446 as per B/P submitted; to come with locating fixture and regular equipment including 8 Tool arms complete with cutting tools, 8 master cams, 1 master camshaft, 2 dogs, and steady rest shoes and arranged for motor drive, we to furnish motor you to mount same to machine.

Motor for operating above:

3 H P Westinghouse 1150 RPM motor, frame #20, type S K., 230 volts, direct current, without pulley, slide rails or starter.

Rebuilt by Willard Mch. Tool Co. on B12033. No charge.

Location—Bldg.	Date
Rouge Camshaft F-446,	5-16-23.
Location—Bldg.	Date
Rouge returning for repair,	8-24-23.
Location—Bldg.	Date
Returned to Rouge Plant,	12-23-23.
Location—Bldg.	Date
B 2 50 x 2 Rouge	1923.

Purchased from
Motch & Merryweather Mchry Co.
Manufactured by
Chas. Gordon Inc.,

F. O. B.	F'g't & C' t'g Weight
Cincinnati, O.	4300
Rec'd Order No.	Price
5-16-23 B-12620	$4335.00

Use
Turn Tractor Camshaft F-446
Rouge Plant.

1691

Ford Form 6710

Ford Motor Company

HIGHLAND PARK, MICH.

(2nd COPY)
PURCHASING DEPT.
PRODUCTION DEPT.
FOLLOW-UP

This Order Number must appear on all Packing Slips, Bills of Lading, Manifests, Packages and Invoices.

Date

Our Order No. B 12620

The FORD MOTOR COMPANY, of Highland Park, Michigan, first party, hereby agrees to purchase and receive, at its River Rouge Plant and

8-2-22

[illegible] Co
[illegible]
Detroit Mich

second party agrees to sell, DELIVERY REQUIRED

manufacture and deliver materials specified below, subject to the terms and conditions stipulated: 8-15-22

SHIP VIA [illegible]-4 Springfield - Mail
TERMS 60 days net
F. O. B. Cars Cincinnati Ohio

QUANTITY	DESCRIPTION OF MATERIAL	PRICE
1 only	Gordon Camcraft Turning Lathe; 8-1/4" swing; maximum distance between centers 36"; minimum distance between toolarms 1-5/8"; spindle speeds 80 to 125 varying according to form of cam; feeds .0046 to .000 per spindle revolution; to be arranged to turn our Tractor Camshaft F-446 as per B/P submitted; to come with locating fixture and regular equipment including 6 tool arms complete with cutting tools, 6 master cams, 1 master camshaft, 2 dogs, and steady rest shoes and arranged for motor drive, we to furnish motor and to mount same to machine. Our dim. sheet # L-1039-[illegible] attached	$ 4388.00
	Extra equipment:	
1 only	Complete set of Circular Tools	20.00
	Motor for operating above: One (1) 5 H.P. Westinghouse 1150 R.P.M. motor, frame #20, type S.C., 230 volts, AC, without pulley, Cline reliance starter. Confirming order Paint No. B-12620 in white on this machine All gears to be fully guarded Per quotation June 22nd 1922 (Motor order from [illegible] Mfg Co on PO B-23648)	
Mfg's No. 11869 Ck 64814 Sept 30 22 (A.K.)	Mark and consign: Ford Motor Co (for order B-12620) River Rouge Plant Detroit Mich	

Turn Tractor Camshaft F-446

INVOICE AND RECEIVING RECORD

Material in Transit	Invoice Date	Amount Invoiced	Date Received	Receiving Slip Number	Amount Received	Total Receipts
Rec'd R[illegible] 5-16/23				BT 20 [illegible]		

FOLLOW UP RECORD

Date	Remarks
	8/15
8/18	Carp Checking
8/21	T/y Acknd - Nov 10
10/13	Phone &
11/3	Phone and Ltr 2 Nov
11/3	Phone - Rec'd [illegible]
11/14	Phone - just rec'd Ltr 2 Nov
2/9	Ltr Nov 4 by Shop 2/25
3/17	Ltr Mar 14 to Shop
5/16	Phone - Look for this week
5/25	Phone - Ord 5/8
6/[illegible]	Our Order No. B 12620

DEFENDANT'S EXHIBIT NO. 56

3/17 Phone. Mel reported running but rotating coil not functioning OK Will ship 3/18

3/23 Phone. Ready. Sent (2 shafts) to be ground & returned for sample. When rec'd will ship

3/30 3/30 Awaiting for approved shafts

4/7 Checking

4/- Phone - Mrs Gordon there were camshaft & OK rocker shaft &c.

5/11 Phone. Shaft 5/5 trucked to Hamilton.

1693

JUN 14 1920

61

5-12-20.

T 410

FORD MOTOR COMPANY
DETROIT, MICHIGAN

1623

New Product: Cam shaft shaper.

1. Date work began: 1-12-14.
2. Name of person who suggested it: A. Oberhoffman.
3. Name of person who authorized the work: C. H. Wills.
4. Names of persons conducting work on product: M16C Tool Room
   Mechanical Dept #1.
5. Where work was conducted: Ford Motor Co., Highland Park, Mich.
6. Drawing, or drawings, of the product itself in its various forms:
   Attached.
7. Date work closed: 9-14-14.
8. Date product was put in use: Same.
9. Final disposition of the matter: adopted and in use.
10. Written description of what the product embodies and its advantages:

This machine is used to shape up camshaft before hardening.

It consists of cutters marked A, cams and camshaft marked C, oscillating arm D, gear F and gear E. I is camshaft. The principle of operation is as follows:

Operator places camshaft in position and is clamped down by device marked G and H, operator sets machine going causing cutters to move from left to right. This is done by gear F which meshes with gear E which causes arm D to oscillate, said arm being attached to shaft connected to cutters, these cutters are attached to cam device C which allows them to move up and down with cam on camshaft, as camshaft turns slowly during the operation. This allows cutters to reach all parts of cams.

For further information see prints attached.

I certify the above information is correct to the best of my knowledge.

Sworn to and signed before me this 21 day of May, 1920.

Notary Public, Wayne County, Mich., My commission expires May 15, 1922.

In the United States District Court
Eastern District of Michigan
Southern Division
In Equity
4864

The Cincinnati Ford Lathe Company
PLAINTIFF
-vs-
Ford Motor Company
DEFENDANT

Defendant's Exhibit

DEFENDANT'S EXHIBIT 64

WALCOTT MACHINE COMPANY
Walcott Gear Tooth Grinder
Melling Contour Lathe
Jackson Duplex Die Sinker
Melling Cam Lathe
Jackson, Michigan
U.S.A.

Established 1881 Cable Address, "Walcott," Jackson

July 30, 1929.

The Ford Motor Company,
Dearborn, Michigan.

Attention of Mr. A. M. Wibel:

Gentlemen:

Referring to the balance of your April account, which is $5,926.62, which you have held up on account of the patent situation, wish to say that you have, no doubt, been informed of the plan for the purchase of Gordon and Redlin patent, which will eliminate any cost or damages to the Ford Motor Company.

We, therefore, think it more than fair that you should okay this balance and send us your check.

Hoping you will see this thing in this light, we remain

Very truly yours,

Walcott Machine Company,

D. G. Kimball,
President.

DKG:MH

1643

IN THE UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF MICHIGAN
SOUTHERN DIVISION

The Gordon [illegible] Company, PLAINTIFF
Ford Motor [illegible], DEFENDANT
IN EQUITY 4564

Plaintiff's Exhibit 154a

2-8-16

D-34387

Arthur Colton Co.
Detroit, Mich.

F.O.B. Our plant or Our
Trap Car Ft. of 8th St.

2 Special machines for shaping 8 cams on Cam Shaft T-410 at one time, as per B/P 182-3 complete, excepting Details #365-366 & 367, sheet #92, also except motors.

Material at cost.
Labor at $1 per hr.

DJJ:GF
Oswald
#16738
2/8/16

1- Received 8-19-16
1- " 10-31-16
1- " 12-1-16

PLAINTIFF'S EXHIBIT NO. 154a

Form 464

Ford Motor Company

PERMANENT INVENTORY OF MACHINE TOOLS

MANUFACTURER'S NUMBER 105 FACTORY SERIAL NUMBER 32067

Relining regular cam turning lathe, with regular equipment and tooled to turn cams on F-446 Fordson camshaft; guaranteed production 30 camshafts per hour; headstock spindle to have hand operated chuck; hardened master camshaft to be supplied by us; arranged for chain motor drive, we to supply motor only, you to supply chain, sprockets and guard, and mount motor to machine.

For operating above:

5 HP, 1150 RPM General Electric Motor, Type RC, frame 27A, 230 volts DC, without pulley, slide rails or starter. (B-16577)

Outstanding order B 24802
7-10-24 $ 225.00

Motor	H. P.	Type	Frame	Voltage	Order
LOCATION					
Building	Date	Building	Date	Purchased from Walcott Lathe Co., Jackson, Mich.	
F-446-[illegible]	7-11-24			Manufactured by same	
				F. O. B. Jackson	Req. No. 16440
				Rec'd 7-9-24	Order No. B-13605
				Use Camshaft - Rouge	
				Turning cams on Fordson camshaft,	
				F-446.	

F.G.T.&C.T.G. WEIGHT 3550#

Price $ 4150.00

IN THE [illegible] DISTRICT COURT
EASTERN DISTRICT OF MICHIGAN
SOUTHERN DIVISION

The Gordon Turn Lathe Company, PLAINTIFF
-VS-
Ford Motor Company, DEFENDANT
IN EQUITY 4504

Plaintiff's Exhibit 1546
Defendant's Exhibit

PLAINTIFF'S EXHIBIT NO. 1546

9691

154C

Form 8326 6B—10-49

PRODUCTION AND MACHINE SPECIFICATION

Ford Motor Company

1-8.5-1000
1-8-1000

Date 1-16-51

NAME

PART NO. A-6250

No. req'd per car
Prod. req'd per hr.

Repairs per day
Schedule per day

Production in _____ hours

Opr. Name	Opr. No. 11	Name of Mach.	No.	No. per Hr.	No. of Mach. Req.
Rough Mill Cams		18-Z-1505 Milling Mach. With	603 26	75	.3

3-Z-12994--Water Pan

FIXTURES	TOOLS	GAUGES	REMARKS
Fixture part of Mach.	39-A-1051-1 R. H. Tool	24-A-17543 Snap	(1)24-A-17543 (1)24-A-21924
	39-A-1051-2 L. H. Tool	24-A-21924 Master	(20)39-A-1051-1 (60)39-A-1051-2
	38-A-1245-1 Collet		(1)38-A-1245-1
	38-Z-1245-2 Collet		(1)38-Z-1245-2 (1)18-Z-1505-15
	18-A-1505-15 Draw Car (R.H.)		(1)18-A-1505-161 (3)18-A-1505-46 (6)18-A-1505-45
	18-Z-1505-161 Draw Car (L.H.)		(1)19-A-41 (1)19-A-47-28
	18-Z-1505-46 Steady Roller		(1)19-A-45-44 (1)19-A-46-15
	18-A-1505-45 Steady Pin		(1)19-A-4513
	19-Z-41 Socket		(1)#5 Wrench
	19-Z-47-28 Socket Handle		
	19-A-45-44 1-5/64 Hx Socket		
	19-Z-46-15 2 Sq. Hd. Socket #5 7/8" O. Z. Wrench		
	19-A-45-13 7/8" Socket		

IN THE UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF MICHIGAN
SOUTHERN DIVISION
The Gordon Form I athe Company PLAINTIFF
—VS—
Ford Motor Company DEFENDANT
Plaintiff's Exhibit 154C
IN EQUITY 4564

Part No. _____

Approved _____

PLAINTIFF'S EXHIBIT NO. 154C

FORD FORM 3000 — FORD MOTOR CO. — **OPERATION SHEET** — HOUSE PLANT — DATE 3-6-25 — 154a

FOR SHOP USE CUT OFF THIS SQUARE

NAME OF PART	PART NO.	NO. REQ.	MACH. ON HAND	SCHEDULE PER 16 HRS.	NAME OF OPERATION	OPER. NO.
CAM SHAFT	T-410	1		8677	TURN CAMS	11

NAME OF MACHINE	E. T. NO.	PROD. PER HR.	FIXTURES	TOOLS	GAGES
10-Z-3 FOX Ca... SHAPER	[illegible]	25		30-Z-361 CUTTER	24-Z-1365 .860"-.870"
	[illegible]	25			
	[illegible]	25	AVAIL...	9-Z-32	
	[illegible]	25			
				9-Z-215	
"HILLING CAM LATHES	[illegible]	37	192		
	[illegible]	37	123	46-Z-536 SLIDE ATTACHM. FOR "HILLING CAM LATHE	
	[illegible]	37			
	36592 S	37			
	[illegible] N	37			
	[illegible] N	37			
	[illegible] N	37			
	[illegible] N	37			
	[illegible] N	37			
	35680 N	37		6-Z-6671 SPRING FOR "HILLING	24-Z-10982 CHECK PO-STION OF CAM
	[illegible] N	37			
	[illegible]	37		66-S-12900 Chip Pans	
	[illegible] N	37		38-S-445 Hand Stock	
	[illegible] N	37			
	[illegible] N	37			
	[illegible]	37			
	[illegible] N	37			
	[illegible] N	37			
	[illegible] N	37			
	36247				
TOTAL					

IN THE UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF MICHIGAN
SOUTHERN DIVISION
The Gordon Form Lathe Company PLAINTIFF
—VS—
Ford Motor Company DEFENDANT
IN EQUITY 4564
Plaintiff's Exhibit 154a

PLAINTIFF'S EXHIBIT NO. 154a

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